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Competitive Issues in the Deregulated United States Railroad Industry

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Competitive Issues in the Deregulated United States Railroad Industry

A Thesis

Presented to

Business Administration

and the

Faculty of the Graduate College

University of Nebraska

In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

University of Nebraska at Omaha

by

Johannes Christian Koeppel

November 1997

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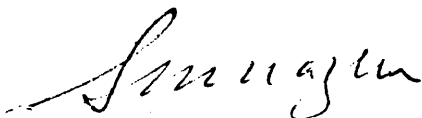


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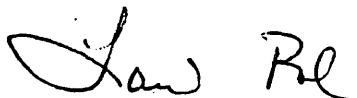
THESIS ACCEPTANCE

Acceptance for the faculty of the Graduate College,
University of Nebraska, in partial fulfillment of the
Requirements for the degree of Master of Business Administration,
University of Nebraska at Omaha.

Committee



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Date Dec. 1, 1997

ABSTRACT

In 1980, the railroad industry was deregulated due to poor industry performance as well as an ideological shift. The newly developed contestable market theory provided the political justification for deregulating what was previously perceived as a natural monopoly. The theme of this study is the examination of whether contestable market conditions exist in the U.S. surface transportation industry which are sufficient to justify giving up direct governmental involvement in the railroad industry. The main generic market structures that play an important role in the regulatory discussion are introduced and implications for regulatory intervention in the case of railroads are drawn. The market structures examined are the perfect competition model, the natural monopoly, the contestable market theory and the cartel. Next, the history of railroad regulation and the changing position of railroads in the surface market is described. This history ranges from beginning of regulation in 1887 up to its abolishment in 1980. The outcomes of railroad deregulation regarding market concentration and operations are analyzed and key factors of railroad profitability are determined. Some consideration is given to the regulatory environment of other surface transportation modes, mainly the trucking industry, because the intermodal market is the relevant market for contestability. The intermodal transportation market which has grown rapidly since deregulation is described and analyzed. The present railroad market is segmented. The segments are

examined for their degree of contestability. Particular markets are introduced. E.g., the market extremes of transportation of wheat out of the Northern Plains and intermodal container traffic in the Ohio River Valley are examined for “fit” of the Contestable Market Theory. Open-access as a suitable alternative form of railroad regulation is discussed.

This study finds that no railroad market segment is contestable and hence that railroad deregulation based on contestable markets is not justified.

Preface

Masters Theses at the College of Business Administration are few and far between; and they are usually encumbered with an air of mystique. A variety of people are involved, and all of these see the thesis in the context of their own goals: as a scientific investigation of a phenomenon, as a tool to teach certain skills, as an unavoidable must, as a vehicle of self-promotion, or as a gift of or to a university.

The time has now come to make a few brief remarks on the context in which this work has been conceived: Professor Donald N. Baum, as Chairman of the UNO CBA Graduate Program Council, and Professor Sufi Nazem and Professor Louis Pol, from the Department of Marketing, have affixed their signatures to this document. But the most significant impact on this piece of work can be attributed to Professor Michael J. O'Hara: my mentor, advisor and friend for our joint excursions into his favorite playground. Without his commitment and patience, bringing my endeavors to a successful conclusion would not have been possible.

But, nominally, the writing of a thesis constitutes only a fraction of the requirements for the acquisition of an MBA degree. I now believe that the real challenge of obtaining an MBA degree lies not simply in dealing with subject matters on an academic level or showing proficiency in particular fields; rather, the real task lies in mastering the administrative challenges involved. By far, the greatest credit in this field goes to my advisor Alexandra M. Kaczmarek. Without her inventiveness, diligence and inspiration, my graduation would simply not have been feasible.

The time is not ripe yet to judge on any long-term value of an UNO MBA degree. Particularly, whether it can provide some competitive advantage for managing business in America, in Europe, or in Asia. The following years may bring about certainty.

Johannes Koeppe
December 16th, 1997
Shanghai, P.R. China

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CHAPTER I.

INTRODUCTION

Railroads were heavily regulated from the late 19th century until the late 20th century. During the era of regulation the transportation industry undergone significant changes. The emergence of the trucking industry introduced a mode able to complement and to some extent substitute for railroad service. The railroads were unable to respond to the new developments appropriately and were plunged into financial crisis.

During the 1970s, leading economists accused the prevalent regulatory system of hindering railroads from adapting their business properly to the new market environment. Deregulation was assumed to be a remedy to restore the financial health of railroads and to reduce government's role in markets. In the late 1970s, the transportation market was totally different from what it had been 80 years prior. Economists argued that the conditions that had ultimately led to regulation 80 years ago were no longer existent. More specifically, the availability of alternative modes of transportation was said to make most of the entire transportation market competitive.

In the 1980 year Staggers Act, Congress explicitly recognized that "today, most transportation within the United States is competitive."¹ Two assumptions set forth by economists provided justification for deregulation. First, regulation was assumed to hinder railroads in responding to their new market environment. Secondly, it was believed that a deregulated railroad industry would permit a competitive surface transportation industry even though railroads were natural monopolies.

The term "Contestable Market" was coined by Baumol in the late 1970s. At the same time, regulation of a number of industries was abolished along with a transition to a more lax antitrust enforcement policy. The gist of the railroad argument is that the surface transportation industry would exhibit characteristics of a "contestable market", a market form that allows competitive conditions in a monopolistic market environment.

The purpose of this study is to analyze the outcomes of deregulation of the railroad industry with respect to its goals and predicted outcomes. Special emphasis is given to the concept "contestability" as a justification for allowing monopolistic market structures. "Contestable markets" are examined to find the extent to which the deregulated railroad industry satisfies the criteria of a

¹ Congressional Declaration of Findings set forth as an Historical Note to 49 U.S.C. 10101(a).

contestable market. Also, alternative regulatory means are examined for suitability to increase competition in the deregulated railroad industry.

In Chapter II, the main generic market structures that play an important role in the regulatory discussion are introduced and implications for regulatory intervention in the case of railroads are drawn. These market structures are the perfect competition model, the natural monopoly, the contestable market theory, and the cartel. Issues like universal service to isolated shippers, price discrimination against shippers, internal cross-subsidizing, sunk-costs, and predatory pricing are analyzed in general.

In Chapter III, the history of railroad regulation and the changing position of railroads in the surface transportation market are described from the beginning of regulation in 1887 up to its abolishment in 1980.

Chapter IV begins with a brief overview of railroad specific terms. Next, the outcomes of railroad deregulation regarding market concentration and operations are analyzed and key factors of railroad profitability are determined. The chapter concludes with an overview of the trucking industry and the main provisions of the deregulation of the trucking industry, since trucking is often a close substitute for rail.

In the first section of Chapter V, the intermodal transportation market, which has grown rapidly since deregulation, is described and analyzed. In section two, the present railroad market is segmented and the segments are examined for their degree of contestability and particular markets are introduced. Chapter V concludes with a discussion whether open-access as a suitable alternative form of railroad regulation. The findings of this study are presented in Chapter VI.

CHAPTER II.

ECONOMIC BACKGROUND

A. Perfect Competition

A perfectly competitive market satisfies the following criteria:²

1. Large number of small buyers and sellers,
2. All firms maximize profit,
3. Free and costless entry and exit,
4. Potential entrants face the same market demands as those available to incumbent firms. Products are homogenous, consequently there is no brand loyalty,
5. Potential entrants face the same productive techniques as those available to incumbent firms,
6. Equal access to input markets, especially equal access to factor prices, and
7. Perfect information.

If all of the features for perfect competition are present except the last one, then the market is described as purely competitive rather than perfectly competitive.³

² Tisdell, 1982, p. 182. See also Dewy, 1975, p. 127. See also Shows, 1972, p. 279.

³ Shows, 1972, p. 281.

In the following discussion the criteria for perfect competition are discussed briefly and some implications of the model will be highlighted.

The distinguishing feature of the perfect competition model is that the market consists of a large number of small ("atomistic") buyers and sellers. Each firm is so small that no one can, acting alone, influence market price by varying output quantity, and no group of firms can form to act in concert to influence market price.

The production technique characteristic to the industry causes each firm's average total costs to increase as output increases after passing through a minimum cost (see Figure 1 on page 7). Given the individual firm's cost characteristics and assuming total industry demand exceeds individual firms' efficient scale of production ($Q' \gg q'$), it is more efficient to allocate total industry production among a large number of firms with each firm producing at the minimum of average total costs.

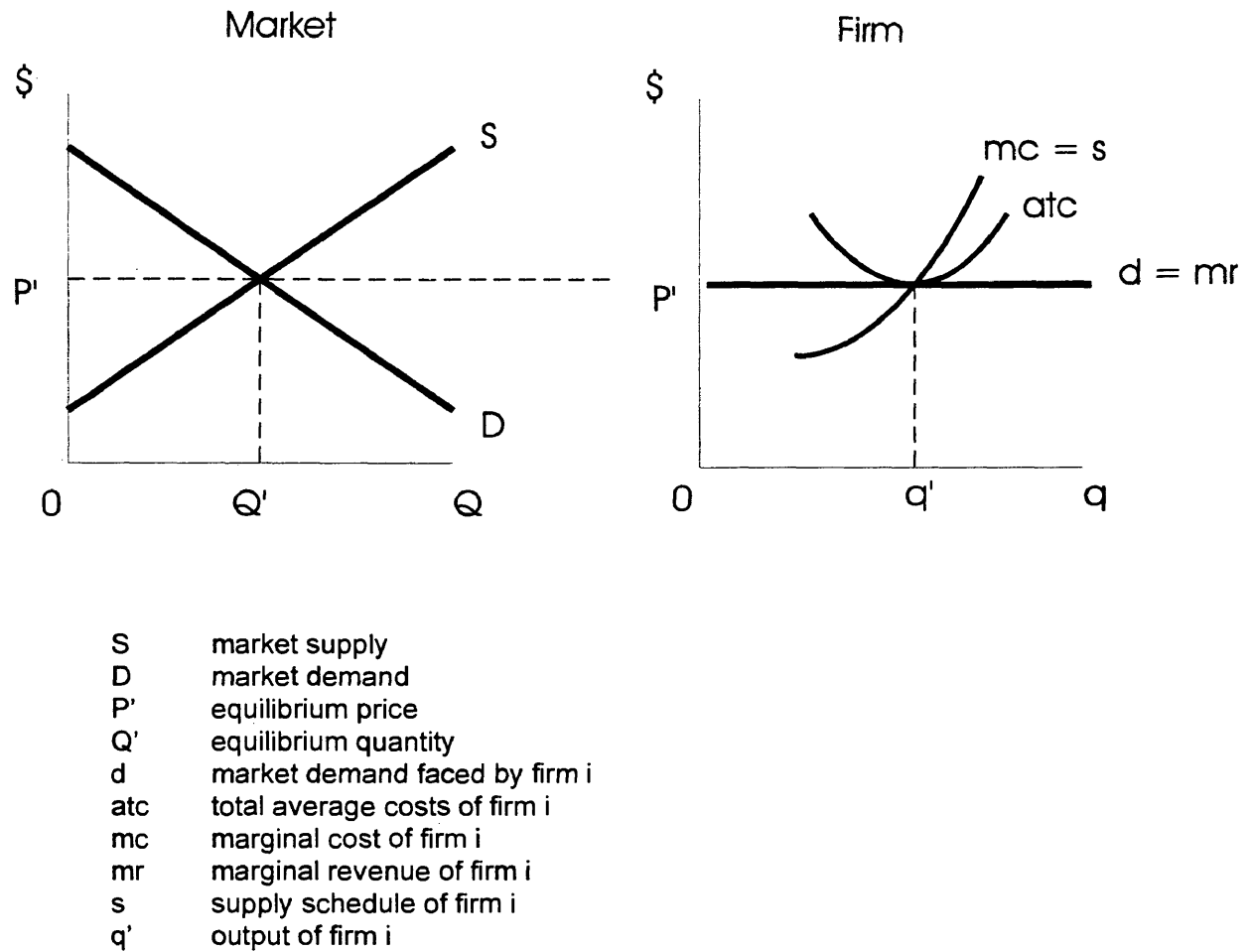


Figure 1: The Demand And Supply Schedule For The Industry And The Individual Firm Under Perfect Competition.

Because no firm can influence market price by varying its output quantity, the individual firm faces a horizontal demand curve equal to the competitive industry's equilibrium price. This implies that the market price P' does not change over the firm's entire output range. All firms are considered to be *price-takers*, maximizing their profit by selecting the quantity of output at which marginal revenue (mr) is equal to marginal cost (mc). A horizontal demand curve yields marginal revenue equal to demand. Applying the profit maximization rule

of ($mc = mr$), and noting that $mr = d = P'$ means that the market yields a “price taker” which will produce where $P' = mc$.

Raising its price above the competitive level on the part of a single firm would simultaneously cause two effects. First, since the firm faces a horizontal demand curve, it would immediately lose all its customers. Second, attracted by excess economic profit, any entrepreneur would immediately enter the market and serve the former firm’s demand. Correspondingly, a price below the market equilibrium price (which is equal to average total costs) would cause an economic loss and make the firm leave the market in the long run. Equilibrium is reached when no firm desires to enter or leave the market. Hence, the condition for the equilibrium to be sustainable is that price equals each firm’s minimum average total costs in the long run.⁴ At this point each firm i in the industry produces an output of q'_i . Summing up the individual firms’ output yields total industry supply

$$Q' = \sum_i^n q'_i$$

where n equals the number of firms in the industry. In sum, for the equilibrium under perfect competition the following conditions are effective:

⁴ In the short run, the firm stays in the industry as long as the price is equal or above variable cost. To achieve allocative efficiency, the price taker firm produces *only and always* the output where price equals marginal cost.

$$P' = mc = atc = mr = d.$$

That is, in the long run each firm earns zero economic profit but it can recover its full costs.⁵

1. Normative Implications of the Perfect Competition Model

The following implications can be inferred from the foregoing explanation:

1. In a perfect competitive industry each firm earns zero economic profit since market price equals each firm's average total costs ($P' = atc$) in the long run. On the other hand, each firm can recover its full costs in the long run. Therefore, under perfect competition neither firms nor consumers are favored at the other's expense.
2. Under perfect competition, production in each individual firm and hence in the industry occurs where average total costs of production are minimal (see Figure 1 on page 7). Therefore, under perfect competition the industry

⁵ Economic profit also is defined as "rent". It must be pointed out that economic profit does not equal profit in an accounting sense (accounting profit). Both accountants and economists calculate profit by subtracting costs from total revenue. However, costs are calculated differently. While accountants calculate costs solely on the basis of physical assets, depreciation and book value, economists add opportunity cost of the firm's resources as an implicit cost. Therefore, at zero economic profit the firm earns an economist's normal profit (which may require a profit in an accounting sense) sufficient to stay in the industry in the long run.

archives the definition of *production efficiency*.

3. Under perfect competition, production in each individual firm and hence in the industry occurs where price equals marginal cost of production. Some economists contend that marginal cost, besides measuring variations in actual production costs from the firm's perspective, also measures opportunity costs of production from the point of view of society (social costs).⁶ Following that reasoning, an industry achieves *allocative efficiency* under perfect competition because market price equals society's opportunity costs of production.

Because under perfect competition price would equal both private marginal cost and private average total costs, and private marginal cost would equal social marginal cost, economists often set perfect competition equal to *Pareto Optimality* if no externalities are present.⁷ A Pareto Optimum is the locus in a set of individual utility functions at which it is not possible to make somebody better off without making somebody else worse off. Therefore, under Pareto Optimality social welfare is said to be maximized. Both the definition of Pareto Optimality as an indicator for maximum social welfare and the identification of

⁶ Tisdell, 1982, p. 218-219. According to Tisdell, an industry's marginal costs are equal to the costs society would incur if it would allocate that industry's resources elsewhere in the most efficient way.

⁷ Dewey, 1975, p. 229.

Pareto Optimality with perfect competition have not been accepted unanimously.⁸

Nevertheless, it can be established with certainty that in a perfect competitive industry neither firms nor consumers are favored at the other's expense because market price equals each firm's average total costs. Hence, in a sense of equal welfare distribution, perfect competition is the preferable market form.

2. Limitations of the Perfect Competition Model: The Decreasing Cost Case

The model of perfect competition is based on the assumption that it is more efficient to allocate total industry production among a large number of equally sized firms. Fragmentation of the industry, in turn, makes each individual firm face a horizontal demand curve set at the industry's equilibrium price. From the perspective of the individual firm, expansion is constrained in the face of increasing costs as output increases.

In contrast, Figure 2 on page 12 depicts the hypothetical case of a firm facing a horizontal demand curve but *decreasing* cost curves over the industry's "entire range of output" such that firms cannot profit maximize at $mr = mc$ since

⁸ For detailed explanation, see Dewey, 1975, chapters 13 and 14.

at no output does $mr = mc$. Instead, at any output above the cost covering output the firm's profit continues to grow until the firm is the size of the industry.

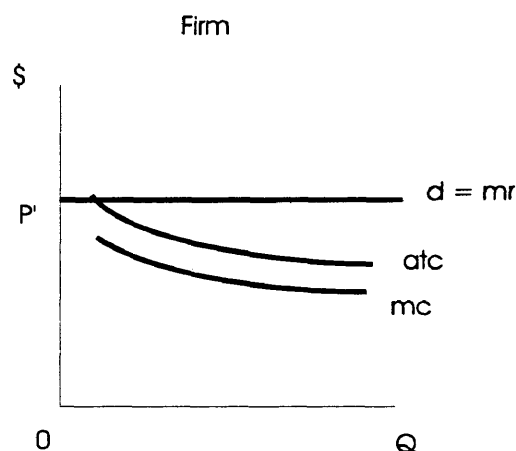


Figure 2: The Firm Under "Perfect Competition" In A Decreasing Costs Industry.⁹

Recalling that product price is assumed to be fixed and all firms maximize profit, a perfectly competitive firm would expand to the end of the industry's demand. The reason is that its marginal cost curve falls further and further below marginal revenue as its production increases, and so marginal profitability of expansion raises.¹⁰ In this case an equilibrium with a number of firms in the industry is not sustainable. This proves to be a contradiction to the basic

⁹ The course of the marginal cost function (MC) intentionally is not exactly specified because it is not crucial for the implications of the phenomenon depicted. However, it is certain that MC is below ATC over the entire range of output.

Proof: $TC = FC + VC \cdot Q$ and $FC \gg VC$ (fixed costs are relatively high \rightarrow in comparison variable costs are small and hence nearly constant over the entire range of output).

$\rightarrow MC = \frac{\partial TC}{\partial Q} = VC$ (1); $ATC = \frac{FC}{Q} + VC$ (2); $\lim_{Q \rightarrow \infty} ATC = VC$ (3). $\frac{FC}{Q} > 0 \rightarrow$

$ATC > MC$ where $Q < \infty$.

assumption of the perfect competition model saying that there is a large number of small firms in the industry. Decreasing costs over a large scale of output constitute a phenomenon called “economics of scale”.¹¹ The normative implication of this phenomenon is that in decreasing-cost industries perfect competition is not feasible. Rather, the industry is a *natural monopoly*.

B. The Natural Monopoly

An industry is said to be a natural monopoly if, over the entire relevant range of outputs, the firm’s cost function is strictly *subadditive*.¹² In the *single product case*, subadditivity means that a firm can produce an output q to supply the entire market at a lower unit cost than k firms,

$$C(q) < \sum_{i=1}^k C(x_i).$$

In the *multiproduct case* subadditivity is defined in the same way, meaning that a single firm can produce a set of outputs at a lower unit cost than two or more firms,

¹⁰ Tisdell, 1982, p. 221.

$$C(y + y') < C(y) + C(y') .$$

For the single product case, *economics of size* are sufficient for subadditivity. Railroads have been a typical example for a natural monopoly (i.e., investment in infrastructure and rolling stock requires high expenses which constitute high fixed operating cost whereas variable operating costs are comparatively low).

In the multiproduct case, size economics are not sufficient for subadditivity.¹³ In a multiple output market, subadditivity holds only if there are *economics of joint production*.¹⁴ Tests of economics of joint production are *cost complementarity* or *trans-ray convexity* of the cost function, which are both sufficient for subadditivity by themselves.¹⁵

1. Normative Implications of the Natural Monopoly

¹¹ Large scale of production ("economics of scale") is one of other causes of cost advantages due to large size of the firm. Therefore, in the following the term "economics of size" is used instead of "economics of scale".

¹² Sharky, 1982, Chapter 4.

¹³ Sharky, 1982, p. 62.

¹⁴ Also denoted "economics of scope".

¹⁵ *Cost complementarity* holds if an increase in the quantity of one output reduces the incremental cost of producing other outputs. A two-product cost function C is *trans-ray convex* at a quantity of output y , if there is a line through y with a negative slope such that C is convex along the segment of that line bounded by the output coordinate axes.

First, it must be that in the presence of size economics, society appears to be better off when the entire market is served by one single firm. This is the ideal way for society to achieve allocative and production efficiency to maximize social welfare.

On the other hand, a market served by one firm lacks the “invisible hand” mechanisms that lead to allocative and production efficiency. Under perfect competition no firm can, acting alone, influence market price. If a firm raises its price it will be rejected by the market. However, if the entire market is served by one monopolist, the monopolist possesses market power. That is, the monopolist can influence the market price by varying its output quantity. Because of this a monopolist is also classified as a *price-searcher*, instead of a price-taker.

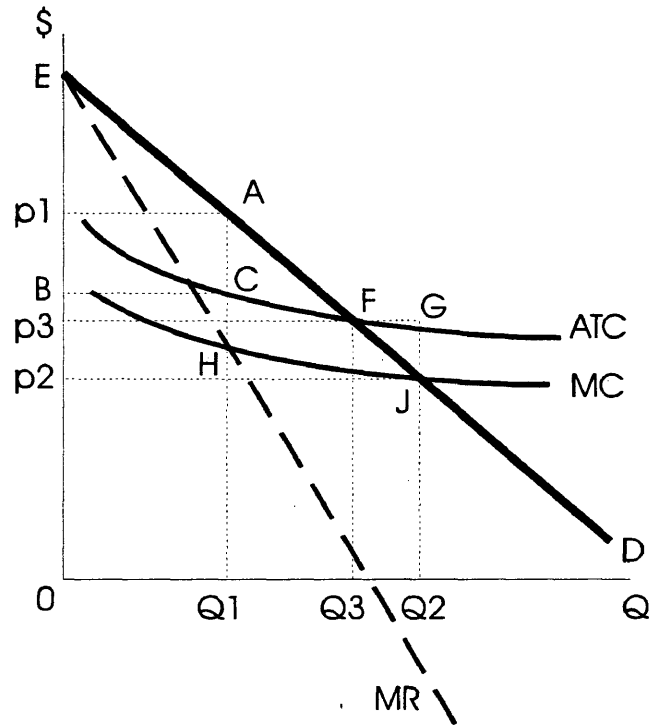


Figure 3: The Natural Monopoly.¹⁶

Like any firm, the monopolist produces a quantity where $MR = MC$ (at point H) in order to maximize his profit. In Figure 3 on page 16 this yields an output quantity of $Q1$ and a price of $p1$.

Different from a firm under perfect competition (Figure 1 on page 16), a natural monopoly does not face increasing average total costs beyond some quantity of output. Therefore, ATC and MC do not intersect at any point (which would be the firm's point of production under perfect competition). In the case of a natural monopoly, marginal cost pricing (as the case under perfect competition)

¹⁶ For the marginal cost curve, see Footnote 9 on page 12.

would yield a point of production at point J, output would be Q_2 , market price would be p_2 , and consumer surplus were p_2JEp_2 . However, it can be seen that at point J the monopolist would suffer a loss since at Q_2 the $ATC > p_2$. This loss is equal to $p_2JGp_3p_2$. The monopolist would have no incentive to produce in the long run unless he would be allowed to engage in price discrimination against consumers.¹⁷

The monopolist restrains output to Q_1 so that he earns a rent equal to $BCAp_1B$, and consumers suffer a loss equal to $p_3FAp_1p_3$ which exceeds the monopolist's rent by far. Consumers retain the surplus p_1AEp_1 . Society suffers a net loss (so called Kaldor-Hicks loss¹⁸) equal to p_3FACBp_3 .

Producing at the cost covering point F would yield a market price p_3 and an output quantity of Q_3 , which is less than the output Q_2 under marginal cost pricing but much higher than the output Q_1 at the monopolist's profit maximizing point. At point F, the monopolist would earn an accounting profit but no economic profit; At the cost covering point F the monopolist would earn an accounting profit but no economic profit; while consumers would suffer a loss compared to marginal cost pricing equal to $p_2JFp_3p_2$. Since $p_2JFp_3p_2 <$

¹⁷ In the short run a firm may produce where $p < ATC$ as long as $p \geq AFC$. If fixed costs are sunk costs (which is the case for a main share of fixed cost in the railroad industry), in the short run a firm may even produce where $p < AFC$. This constitutes the basis for *predatory pricing*.

¹⁸ Tisdell, 1982, p. 214.

p2JGp3p2 (the monopolist's loss under marginal cost production), the optimal point of production would be point F since society's loss is minimal at this point.

The following statements can be inferred from the above observation:

- The distinguishing feature of the natural monopoly is relatively high fixed cost that need to be recovered. Therefore, it is socially desirable that the entire market is served by only one firm to capitalize on size economics.
- The monopolist will, if unregulated, exert market power, select the output where $MR = MC$ and earn a rent at the expense of consumer and social welfare.
- Marginal cost pricing is not feasible under natural monopoly since no production would occur.
- The socially optimal point of production under a natural monopoly occurs where $P = ATC$. Therefore, regulatory policy should set a price ceiling at average total costs.

In the case of the railroads a striking issue is the issue of *universal service*.¹⁹ That is, it is socially desirable that even remote rural areas are served by the railroads. However, assuming there was only one railroad serving the market, it would be inclined to reduce its output quantity, raise its prices and earn a rent. The railroad would operate only main tracks with high traffic density where it can predictably recover its fixed cost. Low density tracks in remote areas would tend to be abandoned. Figure 3 on page 16 provides the theoretical

¹⁹ Knieps, 1988, p. 21.

proof for that behavior. It shows that in the absence of regulation, a monopolist would reduce his output to Q_1 and raise the price to p_1 . A monopolistic railroad may be willing to serve low density lines at higher rates which would constitute a case of *price discrimination* against remote shippers.²⁰ A monopolist might also employ price discrimination against markets if it serves some areas where it faces competition and others where no competition exists. In that case, the railroad would charge rates above average total costs in markets where it possesses monopoly power. A monopolist may use price discriminatory behavior called *cross-subsidizing*. Monopoly power in one market would allow the railroad to charge rates below average total costs in a different market where it faces competition, and hence to achieve a competitive advantage.

Investments in infrastructure do not only constitute high fixed cost but also constitute *sunk cost* because investments in infrastructure cannot be recovered at a future date. Sunk costs have considerable influence in the strategic conduct of firms depending on whether the firm is an insider or a potential entrant.

Potential entrants perceive sunk costs as a barrier to entry because commitment in sunk assets bears the risk of considerable loss. Insiders who already have

²⁰ In terms of law, price discrimination is constituted where $p_A \neq p_B$ for the same commodity ascent prior knowledge of cost differentials equal to the price differentials. In the U.S., price discrimination is illegal under section 2 of the Clayton Act, better known as Robinson-Patman Act (15 U.S.C. § 13). In economic terms, price discrimination is constituted where $\frac{p_A}{MC_A} \neq \frac{p_B}{MC_B}$

(Dewey, 1975, p. 48). Hence, charging higher rates for railroad service in remote areas with lower

incurred sunk cost perceive sunk assets as not relevant for pricing decisions since there is no opportunity to employ those elsewhere. Hence, insiders will stay in the industry as long as revenue covers at least variable cost. If two or more railroads compete directly with each other, each of them might independently fix its prices equal to variable cost in order to attract demand. However, since revenues do not cover total costs, the firm suffers an economic loss which prevents the firm from maintaining and replacing its assets in the long run. If persistent, then this phenomenon is denoted destructive competition.²¹ If a firm independently sets its prices below its own average total costs and below the competitor's variable cost in order to force a competitor out of business, this behavior is denoted *predatory pricing*.²²

Put together, there are three main structural reasons to regulate railroads:

1. *A natural monopoly might abuse its market power (i.e., earn a rent, practice price discrimination, refuse to contract).*

Regulatory protection against a monopolist's abuse of market power can be attempted by regulatory establishment of a maximum rate the railroad may

traffic density constitutes a case of price discrimination in a law sense but not necessarily in an economic sense.

²¹ Knieps, 1988, p. 48.

²² Shughard, 1990, p. 295. See also Footnote 17 on page 17.

charge (rate ceiling), setting a maximum rate of return the railroad is allowed to earn (rate of return regulation), prohibiting price discrimination and control mergers.

2. To provide universal service ("common-carrier obligation").

To guarantee universal service, regulatory authorities may confer a general obligation to contract upon the railroads. This includes control of track abandonments, that is, exit. The regulator takes over the market function of controlling entry and exit.

3. To avoid destructive competition and predatory pricing.

Destructive competition and predatory pricing can be avoided by establishing a minimum price railroads may charge. This price must not be lower than average total costs. Regulation of entry and exit is another means to avoid destructive competition and predatory pricing.

C. The Contestable Market Theory

The contestable market theory is a relatively new theory of industry structure. It was finally formalized in 1982 after more than ten years of preliminary preparations. The theory is a generalization of the model of perfect competition insofar as it allows an oligopoly or even a monopoly instead of atomistic competition to maximize social welfare. The theory states that, even under a monopoly, production can occur at a socially optimal point because the threat of potential entry can encourage the monopolist to refrain from producing inefficiently or earning a rent.

A perfectly contestable market satisfies the following criteria:²³

1. Economics of size or scope may be present, accordingly there may be an oligopoly or even a monopoly in the market.
2. All firms maximize profit.
3. Free and costless entry and exit. Firms enter the market whenever entry is profitable.²⁴ Only sunk costs are regarded to be a barrier to entry and exit.²⁵ Consequently, no sunk costs are incurred upon entry.
4. Potential entrants face the same market demands as those available to incumbent firms. Products are homogenous, consequently there is no brand loyalty.

²³ Baumol, 1988, p. xiii; also Baumol, 1994, p. 42.

²⁴ Baumol, 1988, p. 5.

²⁵ Baumol, 1994, pp. 42-43.

5. Potential entrants face the same productive techniques as those available to incumbent firms.
6. Equal access to input markets, especially equal access to factor prices.
7. Perfect Information.

Entry becomes attractive for potential entrants whenever an incumbent earns a rent. Potential entrants assume that the incumbent's prices are *sustainable* which means that the incumbent does not match the entrant's price immediately upon entry²⁶ (this is the so-called Bertrand-Nash Conjecture²⁷). Therefore, entrants can expect to distract incumbent's business. When the incumbent matches the price, the entrant will leave the market. Exit is assumed to be costless. Per definition, no sunk costs have been incurred so all investments can be recovered fully. A temporary economic profit remains with the entrant. Therefore, entrants can pursue a *hit-and-run-strategy*.

The central statement of the contestable market theory is that the threat of potential entry makes the monopolist allocate resources and produce efficiently. In other words, Pareto Optimality is achieved.²⁸ Pareto optimality is a necessary condition for the monopoly or oligopoly to be *sustainable*, and sustainability is a necessary condition for equilibrium:²⁹

²⁶ Baumol, 1988, p. 11.

²⁷ Knieps, 1988, p. 45.

²⁸ Baumol, 1994, p. 44. See Baumol, 1982 p. 4.

²⁹ Baumol, 1988, p. 11.

“To achieve sustainability, even a natural monopolist must operate in an efficient manner and must earn no more than a normal rate of return on its capital investments. That is, in contestable markets a monopoly firm can only earn zero profits and must operate efficiently.”³⁰

In the early 1980s, when the theory had evolved, its authors claimed that many industries were contestable, especially long distance telephony and the airline industry.³¹ Contestability had been proposed as a general guide for regulation.³² The phrase that has often been cited is that airplanes represent “capital on wings”³³ that is perfectly mobile. By now these assumptions have proved to be misguided. Critics of the theory point out that the assumptions the theory is based on are highly restrictive and that the deductive results would hold only when these pure conditions exist.³⁴ Therefore contestability was far away from reality.

The most restrictive assumption of the Contestable Market Theory is that it regards only sunk costs as barriers to entry and exit.³⁵ However, in reality,

³⁰ Baumol, 1988, p. 6.

³¹ Baumol, 1988, p. 489. See also Bailey, 1981.

³² Baumol, 1988, p. 466.

³³ Baumol, 1988, p. 500.

³⁴ Shepherd, 1995.

³⁵ Baumol, 1994, p. 43.

there are many different barriers to entry and exit, such as legal barriers, switching costs, customer loyalty, experience curves, diseconomies of size, artificial barriers to entry erected by incumbents and so on. These barriers can lessen or even eliminate the threat of entry even if entry involves no sunk costs.

Schwartz points out that the Bertrand-Nash Conjecture does not hold in practice but that in practice incumbents change price rapidly in response to entry which offsets the ease of entry and makes markets noncontestable in the sense that pricing behavior becomes unaffected by the threat of entry.³⁶

By 1994 Baumol came to the conclusion that “a perfect contestable market is a fictional ideal, no more to be found in reality than a market that is perfectly competitive. But [...] the object of using this concept is to give regulators a model for the design of rules for markets that are distinctly *not* contestable.”³⁷

1. Implications of the Contestable Market Theory

Despite the criticism the contestable market theory has been confronted with in terms of its practical applicability it renders some insights for regulation:

³⁶ Schwartz, 1986, p. 55.

³⁷ Baumol, 1994, p. 43.

1. *Fixed cost versus sunk costs.*

A natural monopoly (size economics through high fixed cost) does not constitute a barrier to entry per se but fixed costs must be sunk costs at the same time.³⁸ As long as fixed cost can be recovered potential competition is more likely to keep the industry competitive.

2. *Barriers to entry.*

Since barriers to entry are the main impediment to perfect contestability, regulatory policy should concentrate on the abolishment of barriers to entry.

3. *New definition of the relevant market.*

The idea of the “potential entry” opens up the view of the market. That is, “substitutes” expand to include potential entrants that can compete with the incumbent despite the fact that they might currently belong to a different industry. The relevant market becomes broader. This insight has practical relevance for the regulation of railroads. It is obvious that the railroad industry will never satisfy the criteria for contestability, if for no other reason than the high sunk costs involved. However, other freight transportation industries, like the trucking or the barge industry, can be considered as equivalent substitutes to the

³⁸ Knieps p. 46.

railroads in some contexts. This means that the railroads sometimes directly compete with other surface freight carriers.

4. *Pricing rule for the natural monopoly.*

Potential competition via substitutes sets new standards for defining price ceilings for natural monopolies. It has been shown that under a natural monopoly the rule price equal to marginal cost may not be feasible because of losses the monopolist would incur. This is because of the high fixed cost which does not affect marginal cost at all. The general problem a monopolist faces is that he must charge a markup on marginal cost to recover his fixed cost. The difficulty has always been how to determine the markup.

A well known method to determine the markup on marginal cost is Ramsey pricing.³⁹ The premises for Ramsey pricing is that the monopolist earns no rent and that social welfare is maximized. According to the Ramsey price rule, a monopolistic firm perfectly price discriminates by charging a markup on products in inverse proportion to demand elasticity. But, in the case of railroads, Ramsey pricing does not conform with the provision of universal service and fair rates. In rural areas that are served by only one railroad, demand elasticity will be lower (i.e., fewer choices) than elsewhere so the railroads will charge higher

³⁹ Ramsey, 1927, p. 41.

rates in rural areas. Therefore, Ramsey pricing is an inadequate means for setting railroad rates and rate ceilings, respectively.

In 1981, The ICC⁴⁰ adopted the concept of *stand-alone costs* for determining rate ceilings for railroads. As acknowledged by the ICC, the concept of stand-alone costs (SAC) was derived from the contestable market theory. "A rate level calculated by the SAC methodology represents the theoretical maximum rate a railroad could levy on shippers without substantial diversion of traffic to a hypothetical competing service."⁴¹ The hypothetical competing service is assumed to earn no rent, hence stand-alone costs are equal to its long run average total costs. Thus, the concept of stand-alone costs is based on two principles. First, it is based on the principle of potential entry because stand-alone costs are equal to the price an entrant would charge. Second, stand-alone costs have the character of opportunity costs because shippers are charged rates they would have to pay for the second favorable alternative. However, stand-alone costs do not constitute opportunity costs of production from the point of view of society as marginal cost do. Consequently, stand-alone costs do not maximize social welfare but rather minimize shippers' losses. In addition, it might be hard to determine the long run average total costs of a hypothetical competing service in practice.

⁴⁰ Interstate Commerce Commission, the regulatory authority over U.S. surface transportation, established in 1887 under the Interstate Commerce Act, abolished in 1995.

⁴¹ Baumol, 1988, p. 507.

D. The Cartel

A cartel is created when several firms explicitly agree to act in concert by jointly limiting the quantity of output they produce and jointly setting an uniform price.⁴² Railroads' former practice of collective ratemaking is a form of cartel.⁴³ The effects of a cartel on the market are the same as under monopoly: reduced output quantity, higher price, and increased joint profits of the participants. In the U.S., cartels are illegal under the Sherman Act⁴⁴ for purposes of domestic trade. Figure 4 on page 29 depicts the basic mechanism of the cartel in the case of two participating firms.

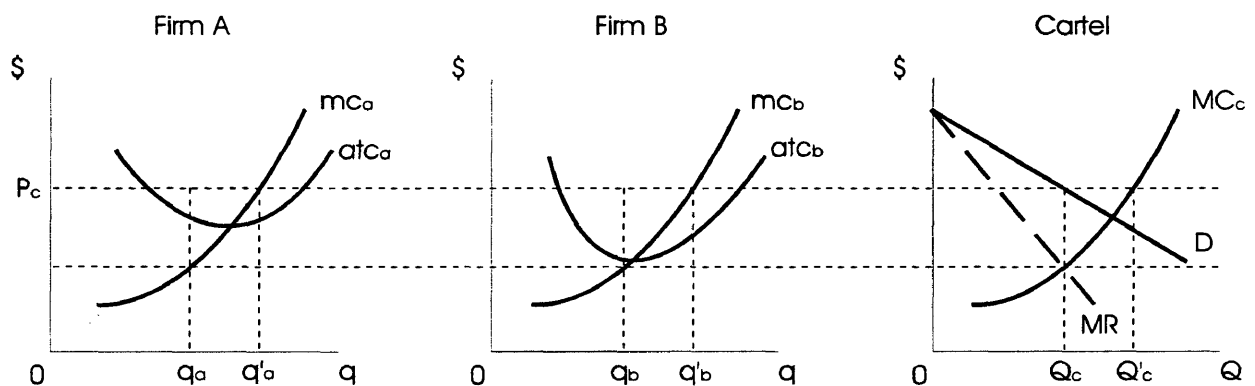


Figure 4: Cartel Production

⁴² Shows, pp. 388-391. For an analytical approach See, Stiegler, 1964.

⁴³ Popper, 1996, p. 26.

⁴⁴ The Sherman Act (15 U.S.C. §1) declares illegal existing conspiracies and combinations in restraint to trade and disproportionately to the firms legal business interests (section 1) and attempts to create them (section 2).

Assuming a market demand D , the cartel maximizes joint profits by setting joint output quantity (Q_c) where joint marginal cost ($MC_c = mc_a + mc_b$) is equal to marginal revenue ($MC_c = MR$). This yields a uniform price p_c . Output is allocated across participating firms in a way that yields maximum efficiency. That is, production in each individual firm i occurs where $mc_i = MR$, which yields outputs of q_a and q_b respectively (where $q_a + q_b = Q_c$) and joint profits

$$\Pi_c = [p_c - atc_a(q_a)]q_a + [p_c - atc_b(q_b)]q_b.$$

However, a cartel is not stable. Provided the uniform price p_c is sustained, each individual firm has an incentive to expand production to q'_a and q'_b respectively in order to maximize its own profit (i.e., $p_c = mc_i = mr_i$). But this behavior would yield a joint output Q'_c which would cause market price to fall and to make the cartel worse off than before. Therefore, to ensure the stability of the cartel, output quantity must be strictly controlled by the participating firms, each of which has the incentive to cheat the others.

CHAPTER III.

FEDERAL REGULATION AND DEREGULATION IN THE U.S. SURFACE TRANSPORTATION INDUSTRY

A. From the Interstate Commerce Act in 1887 to the Motor Carrier Act in 1935

During the second half of the 19th century the extension of the U.S. railroads had been heavily pushed ahead since the railroads had a crucial role in the opening up the west.⁴⁵ The railroads were the first large firms in the U.S. As natural monopolies, the railroad industry exhibited some of the undesirable consequences of monopolies: namely price discrimination and destructive competition. The former constituted a rationale for regulation on the part of shippers and government, the latter constituted a rationale for regulation on the part of the railroads themselves in order to end price wars and to stabilize rates.⁴⁶

With the passage of the Interstate Commerce Act in 1887 the railroads were regulated at federal level.⁴⁷ The Interstate Commerce Act also established

⁴⁵ Wood, 1990, p. 116.

⁴⁶ Friedlaender, 1969, p. 2.

⁴⁷ Winston, 1990, p. 7.

the Interstate Commerce Commission (ICC), the federal regulatory agency that subsequently became responsible for regulation of all other modes of surface transportation. In detail, the Interstate Commerce Act contained the following major sections:⁴⁸

1. All rates were to be "just and reasonable." Unjust and unreasonable rates were prohibited and declared unlawful.
2. Preferential treatment of individuals by special rates, rebates, drawbacks or other devices was declared "unjust discrimination" and made unlawful.
3. Undue or unreasonable preference or advantage to any person, company, firm, area or type of traffic was declared unlawful.
4. It was made illegal to charge more for a short haul than for a longer one, exemptions were feasible in the presence of competition.⁴⁹
5. Pooling of traffic or earnings was prohibited.
6. Railroads were required to publish rates. Increases requires ten days notice.
7. Railroads were prohibited from breaking continuous movements of freight in order to circumvent the act.
8. Carriers were to be liable for damages for violation of the Act.

The Act did not address a prevalent form of price discrimination used by the railroads, the practice of "value-of-service-pricing" (also denoted as "ad valorem pricing"). Under value-of-service-pricing, freight rates were proportional to the value of the commodity carried which meant low rates for agricultural

⁴⁸ Noll, 1983, p. 117.

products and high rates for manufactured goods. Value-of-service-pricing is a rough approximation of Ramsey price discrimination based on elasticity. This rate structure was beneficial for all parties involved. Railroads could recover their fixed cost, farmers and homesteaders had an incentive to settle the western lands and emerging western industries were protected from eastern competition.⁵⁰ In its first annual report the ICC expressly approved of the practice of value-of-service-pricing.⁵¹

The Hepburn Act of 1906 gave the ICC jurisdiction over maximum rates. The Transportation Act of 1920 gave the ICC authority to regulate minimum rates, entry, exit, capital formation, and mergers. At that time the railroads were still the main carrier in the US. In 1948 the ICC was empowered by the Reed Bulwinkle Act to exempt collective rate making by railroads from prosecution under the Sherman Act.⁵² Then, railroads entirely set their rates lawfully, in a cartel fashion, and collectively through rate bureaus.⁵³

⁴⁹ This shows the difference between law price discrimination and economic price discrimination. See, Footnote 20 on page 19.

⁵⁰ Friedlaender, 1981, p. 106.

⁵¹ ICC, 1887, p. 36. In: Friedlaender, 1981, p. 106.

⁵² Noll, p. 118. Collective rate making is like price fixing under cartel and hence was viewed as a combination in restraint to trade. Congressional action clarified the legitimacy of this collective action. See also Footnote 44 on page 29.

⁵³ Rate bureaus are committees formed by common carriers to set rates. See Wood, 1990, p. 525.

B. Emergence of Competing Modes

In the 1920s the trucking industry began to grow rapidly. Entry into the trucking industry was easy because entrants incurred - in comparison to railroads - minimal sunk costs. Technological advances such as development of the pneumatic tire and the gasoline engine, assembly line production and the construction of paved roads facilitated transportation of goods by truck and pushed truck rates down. Moreover, especially in the transportation of high value manufactured goods, trucks had two distinct advantages over railroads: First, the value-of-service pricing standard made rail rates on manufactured goods artificially high. Second, transportation by rails bore a high risk of damage due to slack action of cars in hump yards.⁵⁴ Interstate trucking threatened to disrupt the railroads' cartel by undercutting rates. Not surprisingly, the railroads were the first advocates of federal regulation of interstate trucking arguing that the limitation of entry into the trucking industry and regulated rates would restore "order" in the transportation industry.⁵⁵ That is, the railroads' price cartel could be stabilized. Later entry regulation was also supported by the trucking industry that speculated entry regulation would benefit firms already in the industry.

⁵⁴ GAO, 1993, p. 15.

⁵⁵ Noll, 1983, p. 119.

In 1935 Congress passed the Motor Carrier Act that expanded the ICC's regulatory authority over *interstate* trucking.⁵⁶ Regulation was imposed in three areas: (1) entry (prospective entrants had to prove that additional service was needed), (2) rates, and (3) securities, acquisitions, and related financial transactions and agreements.⁵⁷ Motor carriers were divided up into three types, common, contract and private carriers.⁵⁸ Private carriers and carriers of agricultural commodities were granted exempt carrier status and they were not subject to ICC regulation.⁵⁹ Railroads were not allowed to acquire trucking firms unless the transaction would promote the public interest and the trucking service would be used to public advantage and would not unduly restrain competition."⁶⁰

⁵⁶ The Emergency Railroad Transportation Act of 1933 created the office of Federal Coordinator of Transportation whose duty was to make a study of means for "improving conditions surrounding transportation in all its forms and the preparation of plans therefore" (Emergency Railroad Transportation Act, 1933, chap. 91, 48 Stat. 211). Joseph B. Eastman, an ICC commissioner, was named coordinator. His report was submitted to senate on March 10th, 1934. It included a draft bill which became the basis for the Motor Carrier Act of 1935. The rationale for limiting entry into the motor carrier industry was that virtually all other attempts to regulate motor carrier transportation by the states and by foreign nation included such provisions (See, Noll, pp. 119-121).

⁵⁷ Friedlaender, 1969, p. 111.

⁵⁸ For an explanation see, Classification by Type of Contract on page 93.

⁵⁹ Wood, 1990, p. 38.

⁶⁰ 49 U.S.C. 11344 (c). This provision was originally contained in Section 213 (a) (1) of the Motor Carrier Act of 1935 (Public Law 74-498).

Criterion	Assessment
Large number of small buyers and sellers	In 1929, there were 3.5 million trucks in the US. ⁶¹ In 1935, after the passage of the MCA, 900,000 trucking firms applied for "grandfather rights". ⁶²
All firms maximize profit	It can be assumed with complete certainty that all firms in the industry practice profit maximization.
Free and costless entry and exit	A trucking business can be run as a sole proprietorship. The only main asset that is required is the truck itself. A truck is not fixed to a certain route and can be sold off at present market value at any time. There are potential but no implicit economics of size in the trucking industry. ⁶³ Therefore, entry and exit are free and costless.
Potential entrants face the same market demands as those available to incumbent firms. Products are homogenous, consequently there is no brand loyalty	The trucking industry is fragmented, consequently both firms and entrants face a small, qualitatively identical equal share of demand. Asymmetry in service can be eliminated easily
Potential entrants face the same productive techniques as those available to incumbent firms	In the trucking industry, the basic productive technique is the truck. Trucks are mass products, therefore entrants face the same productive techniques as those available to incumbent firms.
Equal access to input markets, especially equal access to factor prices	Input factors in the trucking industry are fuel, spare parts, stationary and telephone service. All are mass products. Therefore, both firms and entrants have equal access to input markets and factor prices.

Table I: Application Of The Model Of Perfect Competition In The Trucking Industry.

⁶¹ Dempsey, 1989, p. 16.

⁶² Friedlaender, 1969, p. 112. Motor carrier businesses that had existed before the passage of the Motor Carrier Act (MCA) were allowed to continue operations under "grandfather rights". Accordingly, there were at least 900,000 trucking firms in the U.S. in 1935.

⁶³ In the railroad industry there are intrinsic economics of size due to the physical structure of the industry (decreasing cost industry). In the trucking industry it needs to be distinguished between TL and LTL sector. See The Motor Carrier Act of 1980 on page 95. In 1935 there were quite less size economics in the trucking industry than nowadays. By 1967 Nelson (Nelson, 1967, p. 323) states that there are no size economics in the trucking industry. By 1986, Glaskowsky (Glaskowsky, 1986, p. 9, p. 65) acknowledges distinct economics of size in the LTL sector. For a quantitative analysis of economics of size in the common carriers of general commodities see Friedlaender, 1980, p. 173.

At this time it is worthwhile to consider whether the structure of the trucking industry justifies regulation in principle. In the following it is examined to what extent the trucking industry can be regarded purely competitive. In Table I on page 36 all criteria that make up pure competition are evaluated for the trucking industry.

Table I on page 36 shows that the trucking industry is structurally purely competitive. This implies that the trucking industry, left to the “invisible hand forces” of the free market, would adjust in an equilibrium where both firms and consumers enjoy equal shares of welfare. In that sense, social welfare is maximized. Consequently, in the face of welfare consideration no regulation is necessary. This result proves that the regulation of the interstate trucking industry in 1935 has not been established on grounds of welfare or allocative considerations. Given the situation of railroads and existing trucking firms at that time suggests that railroads and incumbent trucking companies have exerted their influence in establishing regulation of the trucking industry for their own benefit. Further, the Transportation Act of 1935 backed up the ICC’s desire to keep freight rates low on shipments of large-volume, low-value agricultural products, presuming these low rates preserved the railroads’ value-of-service rate structure.⁶⁴

⁶⁴ For detailed explanations see Kahn, 1971, p. 14.

Although the trucking industry is the most direct competitor of the railroad industry, there are other modes of transportation that can be at least partly regarded as competing modes to the railroad industry. These are the barge industry, the pipeline industry, and the airline industry. Concerning passenger traffic, the intercity bus industry and the airline industry can be regarded as competing modes. Since this study confines itself to freight traffic, passenger traffic is left out of further consideration. All of these industries have been regulated and then deregulated later. Table II on page 39 provides an overview of the area of regulation with respect to different transportation modes that are potentially suitable to compete with railroads. Because these modes are partly suitable to compete with railroads for shipments, they must be included in considerations about the relevant market of railroads.

Mode	Start of Regulation	Regulatory Authority	End of Regulation
Railroads	1887 Interstate Commerce Act	ICC STB (since 1996) ⁶⁵	1980 Staggers Rail Act ⁶⁶
Interstate Trucking	1935 Motor Carrier Act	ICC STB (since 1996)	1980 Motor Carrier Act ⁶⁷
Natural Gas Pipelines	1938	FPC ⁶⁸ FERC (since 1977) ⁶⁹	
Oil Pipelines	1906 Hepburn Act ⁷⁰	ICC FERC (since 1977)	
Airlines	1938 Civil Aeronautics Act	CAB ⁷¹	1978 Airline Deregulation Act
Inland Water Carriers ("barges")	1940 Transportation Act ⁷²	ICC STB (since 1996)	

Table II: Regulation And Deregulation Of Transportation Modes.

⁶⁵ The ICC had been abolished by 12/31/95. Most of its remaining authority has been transferred to the Surface Transportation Board (STB), an independent body attached to the U.S. Department of Transportation (DOT). See, Omaha World Herald, 11/22/95.

⁶⁶ Under the Staggers Act the railroad industry was not fully deregulated, although the Staggers Act is regarded as the threshold towards deregulation.

⁶⁷ Under the Motor Carrier Act of 1980 interstate trucking was not fully deregulated, although the Motor Carrier Act of 1980 is regarded as the threshold towards deregulation.

⁶⁸ Federal Power Commission (FPC). See, Wood, 1990, p. 147.

⁶⁹ Federal Energy Regulatory Commission (FERC), an independent body created by the new U.S. Department of Energy (DOE) in 1977. See, Wood, 1990, p. 146.

⁷⁰ Wood, 1990, p. 37.

⁷¹ Civil Aeronautics Board (CAB).

⁷² Friedlaender, 1969, p. 22.

C. Movement towards Deregulation

After 1935, two developments favored the trucking industry rather than the railroads. First, the Federal Aid Highway Act of 1956 immensely pushed ahead the improvement of the interstate-highway system. It created the Highway Trust Fund which received its funds exclusively from highway-use taxes. Its goal was to construct a sophisticated 40,000 mile long highway system throughout the U.S.⁷³ Second, as a result of industrial growth, high-value manufactured goods accounted for an increasing share of the total amount of goods carried. The establishment of manufacturing industries in suburban areas where no railroad terminals were available also favored trucking service.⁷⁴

Figure 5 on page 41 and Figure 6 on page 42 depict the volume distribution of intercity freight traffic with respect to modes for the period from 1939 to 1995. It is clearly visible that particularly the trucking industry diverted traffic away from the railroads. Kahn blames the ICC ratemaking for the diversion of traffic.⁷⁵ Although rail and truck rates were set commonly, it was feasible to circumvent ICC regulation through the (truck) exempt carrier status. Exempt carriers invaded the common carrier market by leasing out their trucks at cut-rates to common carriers for the return trip or by fictionally purchasing the

⁷³ Wood, 1990, p. 94.

⁷⁴ Meyer, 1974, p. 142.

⁷⁵ Kahn, 1971, p. 19.

goods for the period of transit. Not bound by rates set by the ICC, exempt carriers were free to quote whatever charges they pleased and to undercut railroad rates that were set by the ICC. In 1964, about two-thirds of intercity truck ton-miles were handled by exempt motor carriers.⁷⁶

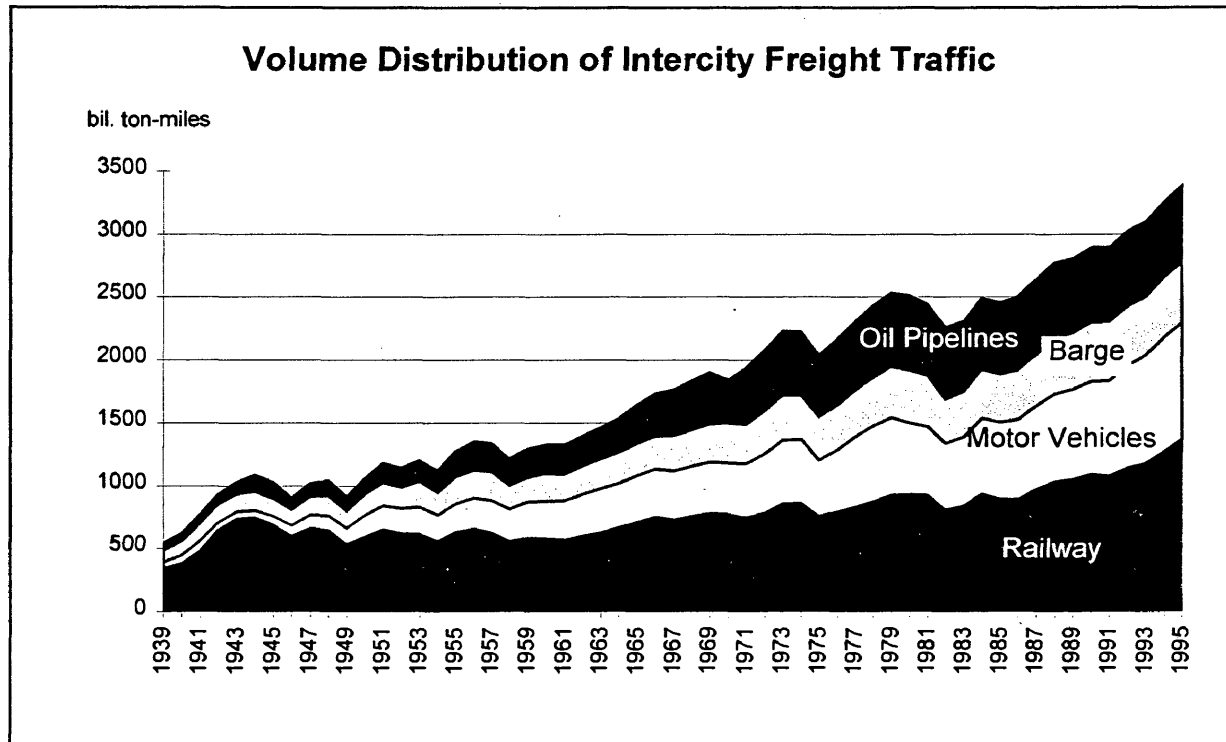


Figure 5: Estimated Volume Distribution Of Intercity Freight Traffic, Public And Private, In Ton-Miles,⁷⁷ By Modes Of Transport, 1939 - 1995.⁷⁸

⁷⁶ Kahn, 1971, p. 21. According to the 1963 Census of Transportation, in 1963 42,986 of the 57,800 motor carriers in the U.S. in that year were exempt carriers.

⁷⁷ For explanation see Weight/Distance on page 55.

⁷⁸ Data from Moody, 1996, p. a5.

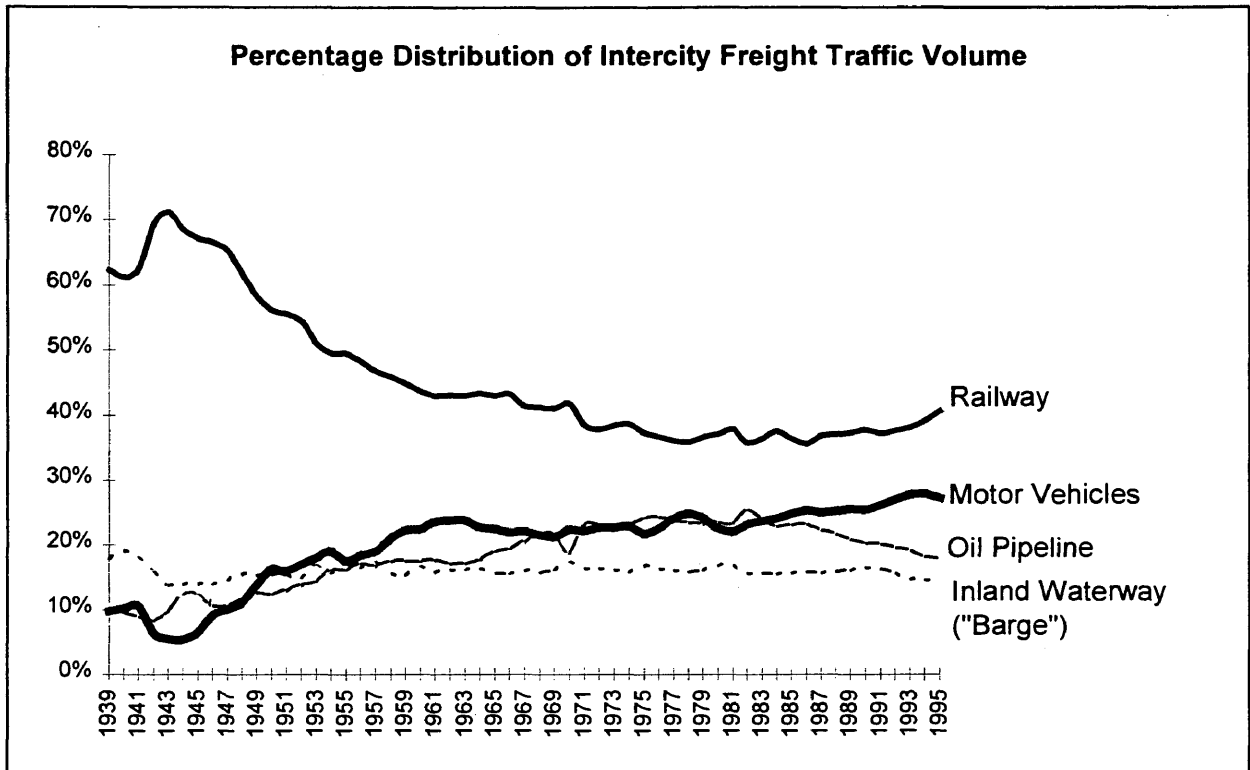


Figure 6: Estimated Volume Distribution Of Intercity Freight Traffic, Public And Private, As Percentage Of Total Ton-Miles Carried, By Modes Of Transport, 1939 - 1995.⁷⁹

In addition to drawbacks due to structural changes and regulation itself, inflexible labor contracts put a heavy cost burden on the railroads.⁸⁰ The oil crises in the early 1970s made the main input factor of railroads more expensive and slowed demand for railroad service down. On the other hand, the ICC approved proposed abandonments of unprofitable lines only with reluctance to maintain the railroads' common-carrier obligation.

⁷⁹ Data from Moody, 1996, p. a5.

⁸⁰ Keeler, 1983, p. 50.

Economists point out that regulation may in fact stipulate costs that may outweigh the social gains of regulation. Regulation may impose costs on society (1) in the form of *administrative costs* and (2) in the form of opportunity costs caused by *resource misallocation* (as a result of rate of return regulation and *ad valorem* pricing⁸¹) and creation of *excess capacity* (as a result of the common-carrier obligation⁸²) on part of producers and *distortion of demand*. Regulation was also said to stifle innovation. Different econometric studies on the effects of regulation have been conducted. In the view of social losses incurred through regulation many of them argue for deregulation.⁸³

Excess capacity was seen as prevalent impediment to efficiency. Mergers have traditionally been regarded as potential remedy. In 1920, Congress directed the ICC to conduct a study to consolidate the railroads into 18 to 20 railroads.⁸⁴ Congress adopted the plan in 1929 but it was never realized. In the early 1960s the argument for merger was that railroads operating at efficient size were able to apply a rate system which was more closely based on costs (in contrast to the prevalent value-of-service pricing system) which in turn would

⁸¹ Denoted *Averch-Johnson Effect*; See, Averch, 1962.

⁸² For an econometric model see Levin, 1981. Levin finds that excess capacity (low density lines) is a primary source of the unprofitability of the U.S. railroad industry.

⁸³ For a full discussion of the economical consequences of regulation, see Friedlaender, 1969, Chapter 4 (includes references). See also Peck, Merton J.: *Competitive Policy for Transportation*; in: John R. Meyer and others: *The Economics of Competition in the Transportation Industries*, Chaps. 6 and 7; Harvard University Press; Cambridge, MA, 1959. Also see: Boyer, Kenneth D.: *The Costs of Price Regulation: Lessons from Railroad Deregulation*; *Rand Journal of Economics*; Vol. 18, pp. 408-416, Autumn 1987.

⁸⁴ Friedlaender, 1969, p. 138.

increase economic efficiency in the transport sector. Friedlaender identifies side-by-side mergers of line-haul railroads operating in the same territory as most suitable form of mergers that would reduce excess capacity.⁸⁵ Friedlaender also notes that mergers would increase market power of the remaining railroads substantially which would require regulation to be even more extensive.⁸⁶

As a result of financial difficulties, many railroads were forced into bankruptcy. The industry's average rate of return (see Figure 7 on page 45) stayed well below the 5.5 percent that the ICC regarded as an adequate rate of return.⁸⁷ Most of the bankrupt railroads were acquired by or merged into financially sound railroads. The continuously poor financial situation of the railroad industry led to deterioration of track infrastructure due to deferred maintenance. Low speed and high accident rates made railroad transportation less attractive. Rolling stock often was in better condition since it was operated under lease.⁸⁸ During the 1970s approximately 20% of the railroad industry operated under bankruptcy.⁸⁹

⁸⁵ Friedlaender, 1969, p. 139. See also Footnote 156 on page 78.

⁸⁶ Friedlaender, 1969, p. 140.

⁸⁷ Müller, 1988, p. 182.

⁸⁸ Müller, 1988, p. 191.

⁸⁹ Wood, 1990, p. 129.

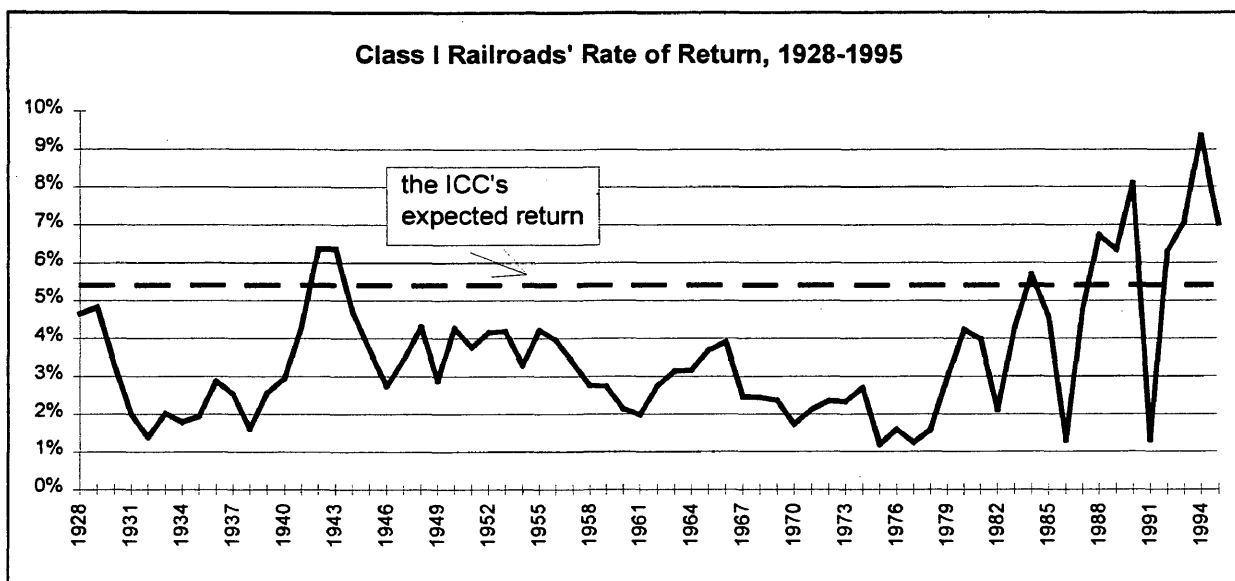


Figure 7: Class I Railroads:⁹⁰ Rate Of Return 1938 - 1995.⁹¹

In the 1970s, federal government countered these developments in order to improve the financial situation with the ultimate goal to improve railroad transportation service. The main provisions are listed below.

⁹⁰ For details about railroad classes, see on page 93.

⁹¹ Data from Moody, 1996, p. a19. Years 1970-1981 include deferred taxes. Years 1982/83: Computations based on new depreciation Accounting System, computations also reflect the elimination of investment tax credit from net railway operating income. Not comparable to previous years.

1. Rail Passenger Service Act of 1970

The main provisions of the Rail Passenger Service Act⁹² were:

- Creation of Amtrak: The federal government took over the remaining intercity passenger service. Passenger service had become unprofitable due to substitution by private car traffic.
- Railroads were granted greater autonomy in ratemaking and abandonment and merger processes were eased.
- The ICC was given authority to eliminate rate regulation where it served "little or no useful public purpose" and was ordered to consider railroad revenue needs in judging rate reasonableness.

However, the ICC complied with the new rules reluctantly.⁹³

2. Emergency Rail Services Act of 1970

The Emergency Rail Services Act⁹⁴ authorized federal loan guarantees for bankrupt carriers. Background was the acute financial shortage of the Penn Central Railroad. It was estimated that the Penn Central alone would need additional \$100,000,000 to survive the first quarter of 1971.⁹⁵

⁹² Wood, 1990, p. 27.

⁹³ Wilner, 1990.

⁹⁴ Wilner, 1990.

⁹⁵ House Report 91-1770, 12/16/70.

3. Regional Rail Reorganization (3-R) Act of 1973

The preceding event that finally led to the 3-R Act was the bankruptcy of the Penn Central Railroad in 1970.⁹⁶ The Penn Central resulted from a merger of three eastern railroads in 1968 and was the nation's largest transportation company at that time. Under the 3-R Act most of the former Penn Central Railroad and five eastern railroads were merged into Consolidated Railroad Corporation (Conrail). Conrail finally became profitable in 1981. At that time it had consumed \$7.5 billion in federal subsidies.

In addition, the 3-R Act authorized more governmental loan guarantees, and added direct grants and temporary operating subsidies for bankrupts.

4. Railroad Revitalization and Regulatory Reform (4-R) Act of 1976

The 4-R Act was targeted at "efforts to restructure the [railroad industry] on a more economically justified basis."⁹⁷ Its major provision was to systematize the abandonment process and the extension of the subsidy program nationwide.⁹⁸

⁹⁶ Dempsey, 1989, p. 157.

⁹⁷ 45 U.S.C. § 801 (a) (2) (1982). In Dempsey, 1989, p. 151.

⁹⁸ Due, 1990, p. 18.

5. The Staggers Rail Act of 1980

Section 2 of the Staggers Rail Act⁹⁹ states:

“The Congress hereby finds that

- (1) historically, railroads were the essential factor in the national transportation system;
- (2) the enactment of the Interstate Commerce Act was essential to prevent an abuse of monopoly power by railroads and to establish and maintain a national railroads network;
- (3) today, most transportation within the United States is competitive;
- (4) many of the Government regulations affecting railroads have become unnecessary and inefficient;
- (5) nearly two-thirds of the Nation’s intercity freight is transported by modes of transportation other than railroads;
- (6) earnings by the railroad industry are the lowest of any transportation mode and are insufficient to generate funds of necessary capital improvements;
- (7) by 1985, there will be a capital shortfall within the railroad industry of between \$16,000,000,000 and \$20,000,000,000;
- (8) failure to achieve increased earnings within the railroad industry will result in either further deterioration of the rail system or the necessity for additional Federal subsidy; and
- (9) modernization of economic regulation for the railroad industry with a greater reliance on the marketplace is essential in order to achieve maximum utilization of railroads to save energy and combat inflation.”

⁹⁹ Public Law 96-448; 96th Congress; Oct. 14, 1980. For a brief summary see: “Deregulation: What happens next?”; Railway Age, Vol. 181, p. 10; October 27th, 1980.

The Staggers Rail Act is enormously complex and often highly specific. It governs railroad rates and inter-carrier practices (Title II), railroad cost determinations (Title III), railroad modernization assistance (Title IV), and provisions for Conrail and other railroads and organizations. Its main provisions are:¹⁰⁰

a. Zone of Rate Flexibility

Generally under the Staggers Act, each railroad may set its rates independently of the ICC and rate bureaus. Railroads were permitted to increase rates by 6 percent per year until 1984 with an aggregate increase to not more than 118 percent of the 1980 rates. After 1984, rates may raise by 4 percent per year. The ICC may allow additional adjustments for inflation. There were provisions for surcharges in some cases such as interline traffic and on branch lines. Rates had not to be lower than variable cost.¹⁰¹

Rates were subject to ICC regulation only in markets where the railroad possessed market dominance. Market dominance meant an absence of effective competition from other rail carriers or modes of transportation for the transportation to which a rate applies.¹⁰² In those markets rates had to be

¹⁰⁰ Public Law 96-448, see also Wood, p. 129.

¹⁰¹ Railroads may set rates below variable cost to engage in predatory pricing.

¹⁰² 49 U.S.C. § 10707 (a).

“reasonable”. That is, it had not to exceed 160 percent of variable cost. This percentage was raised subsequently to 180 percent in 1984. A shipper challenging a rate had the burden of proving that the rate is not reasonable if the rate exceeded the applicable revenue-variable cost percentage for the particular by less than 20 percent or if the revenue-variable cost percentage is lower than 190.

b. Contract Rates

Contracts between railroads and individual shippers were legalized. A summary of nonconfidential contract terms had to be filed with the ICC. Rates, shipper, origin and destination did not have to be disclosed. Railroads were not allowed to commit more than 40% of their cars for agricultural products to contracts.¹⁰³

c. Consolidation, Merger, and Acquisition of Control

Existing guidelines were not changed in principle. Applications for transactions had to be filed with the ICC which approved or rejected the application. The ICC is required to consider at least (A) the effect of the proposed transaction on the adequacy of transportation to the public; (B) the

effect on the public interest of including, or failing to include, other rail carriers in the area involved in the proposed transaction; (C) the total fixed charges that result from the proposed transaction; (D) the interest of carriers employees affected by the proposed transaction; (E) whether the proposed transaction would have an adverse effect on competition among rail carriers in the affected region.¹⁰⁴ The Staggers Act eased transactions insofar that the considerations stated above must be made only if the transactions involves at least two Class I railroads.¹⁰⁵ ICC merger approval conferred automatic antitrust immunity over these transactions.¹⁰⁶ Provisions for acquisition of motor carriers were not changed.¹⁰⁷

d. Abandonment

Railroads were still required to file applications for abandonments with the ICC, however, proceedings were further streamlined.¹⁰⁸

¹⁰³ For a brief summary see "ICC issues rules on contract rates"; *Railway Age*, Vol. 181, p. 12; November 10th, 1980.

¹⁰⁴ 49 U.S.C. § 11344 (b); clause (E) is added by the Staggers Act.

¹⁰⁵ Public Law 96-448, Sec. 228.

¹⁰⁶ Dempsey, 1989, p. 160.

¹⁰⁷ See Footnote 60 on page 35.

¹⁰⁸ Public Law 96-448, Sec. 402.

6. Assessment of the Staggers Rail Act

The Staggers Act expressively favors the railroad industry. The federal government recognized the railroads' economic plight under regulation. It has identified other modes of surface transportation - mainly the trucking industry - a real competitor for transportation. Although railroads constitute a natural monopoly with all its drawbacks and risks for public interest, deregulation is justified on the grounds of competition with the trucking industry. In economic terms that is, through competing with the trucking industry the railroad market will adjust at a socially optimal equilibrium.

With the Staggers Act railroads mainly gain control over ratemaking, an extremely valuable tool to work out individual pricing and marketing strategies. This, in turn, provides options to differentiate and to attract particular market segments. On the other hand, since railroads constitute a natural monopoly, pricing autonomy also confers ability to exploit market power. True, the Staggers Act provides some remedies for abuse of market power. Nevertheless, it is worthwhile to consider these remedies. Under the Staggers Act, both the zone for rate flexibility and the threshold for market power are defined in dependence on variable cost. Variable cost is a quantity internal to a firm that cannot be determined accurately from the outside. On the other hand, hurt shippers have the burden to prove that rates are outside the permitted zone. Given the nature

of variable cost, shippers have extreme difficulties to set forth that proof. On the contrary, the provisions allow some leeway to manipulate on part of the railroads.

The political circumstances prevalent in 1980 give some indications that the movement towards railroad deregulation was not only economically but also politically motivated. First, through the bankruptcy of Conrail the federal government became directly involved in the poor economical condition of the railroads. The drain of considerable funds as subsidy for Conrail, which is located in the densely populated area immediately surrounding Washington, certainly had a stronger impact on decision makers than supposedly captive shippers¹⁰⁹ being scattered somewhere in the West. Second, the airline industry that had been deregulated in 1978 exhibited some noticeably positive effects of deregulation immediately after deregulation.¹¹⁰ Consequently, deregulation was perceived to be a step into the right direction. Moreover, critics of deregulation hold that the ICC has become subsequently politicized.¹¹¹ Since 1969, the President of the United States possessed the authority to designate the chairman among the commissioners of the ICC.¹¹² Beginning in the Ford administration, all appointees to become ICC commissioners were strong advocates of deregulation. The most prominent example was its chairman

¹⁰⁹ A shipper is denoted a *captive shipper* if its facility is served by one railroad and, due to volume or commodity constraints, another mode could not practicably be used to transport the traffic.

¹¹⁰ Blechschmidt, 1996, p. 37.

¹¹¹ Dempsey, 1989, p. 223.

appointed by President Carter, the economist Darius Gaskins. This politicization of the ICC brought about an interpretation of rules in favor of railroads.¹¹³

¹¹² 83 Stat. 859 (1969). In Dempsey, 1989, p. 233.

¹¹³ Friedlaender 1981, p. 103.

CHAPTER IV.

OUTCOME OF DEREGULATION IN THE U.S. SURFACE TRANSPORTATION INDUSTRY

In this section of the study, outcomes of deregulation in the U.S. surface transportation industry will be examined. Based on the outcomes of deregulation in the U.S. surface transportation industry, the remaining part of this study it is analyzed (1) whether deregulation has achieved its economical goals and (2) whether anticompetitive effects have emerged. This chapter starts with a brief introduction of Industry Specific Measures and Classifications.

A. Industry Specific Measures and Classifications

1. Industry Specific Measures

a. Weight/Distance

A **ton-mile** is the movement of a ton the distance of one mile. A **revenue ton-mile** (also denoted **freight revenue ton-mile**) is the movement of the weight of a ton the distance of one mile where the railroad earns revenue for hauling that ton.

b. Mileage

Miles of road owned is the aggregate length of roadway, excluding yard tracks and sidings, and does not reflect the parallel tracks. In contrast, **miles of track owned** includes multiple main tracks, yard tracks and sidings. **Miles operated** are miles of road owned plus trackage rights.

A **train-mile** is the movement of a train the distance of one mile. Train miles are based on the distance run between terminals.

2. Classifications of Railroads

There are three different classifications for railroads.

(a) Historically, all railroads had to report financial operating information to the ICC. Consequently, the ICC has classified railroads by their level of operating revenue into three classes. The revenue class thresholds have been changed in the past. Last changes were made in 1991 when the ICC set flexible thresholds adjusted annually for inflation. For 1994, **Class I Railroads** had operating revenue of \$ 255.9 million or more¹¹⁴; **Class II Railroads** had revenues of \$ 20.5 million to 255.9 million; and **Class III Railroads** had revenues of less

¹¹⁴ Since 1991, railroads with annual gross revenues of \$250,000,000 or more, adjusted annually for inflation, are classified as Class I Railroads. For previous years, see Figure 9 on page 60.

than \$ 20.5 million. This classification system has been taken over by the STB in 1996.¹¹⁵

(b) Railroads can also be classified by the nature and scope of their business as **Line-haul**, **Switching** and **Terminal** Railroads.

(c) The Association of American Railroads (AAR) classifies railroads into Class I, Regional, and Local Railroads. For **Class I Railroads** the AAR has adopted the STB definition. **Regional Railroads** are line-haul railroads that operate at least 350 miles of road and/or earning revenue between \$40 million and the Class I threshold. **Local Railroads** are line haul railroads falling below the regional criteria, plus all Switching and Terminal Railroads.

Figure 8 on page 58 depicts number, miles operated, number of employees, and freight revenue by type of railroad for 1995.

¹¹⁵ Railroad Facts, 1996, p. 3.

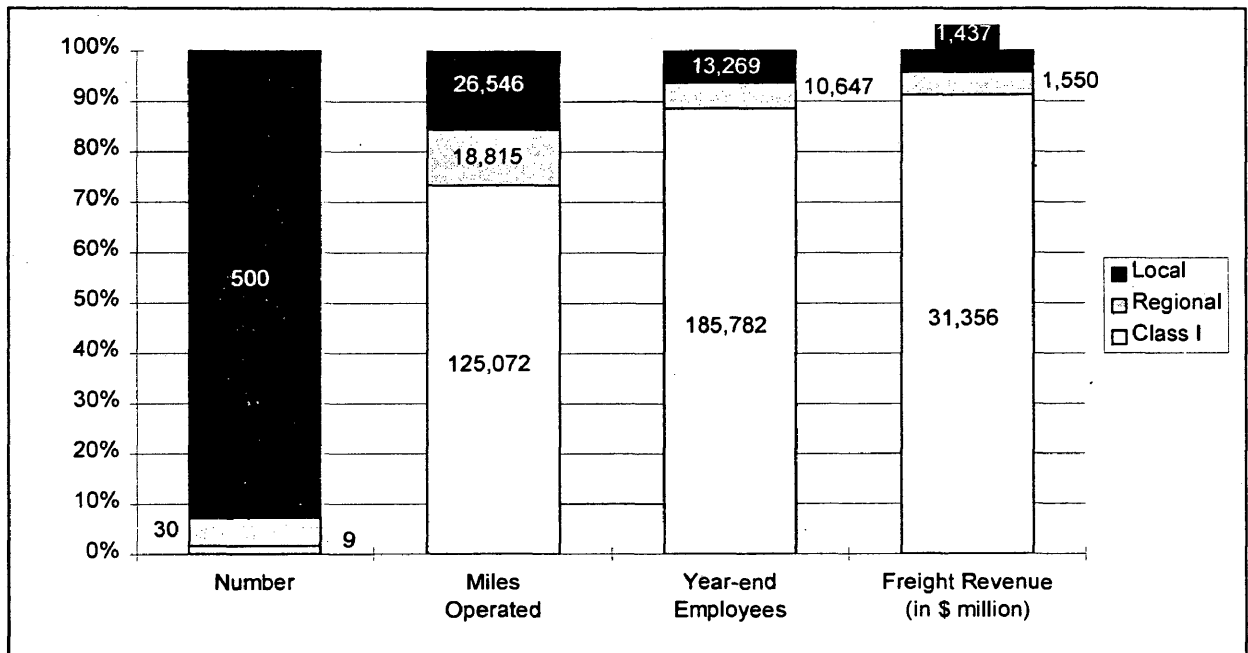


Figure 8: Industry Totals By Type Of Railroad For 1997.¹¹⁶

a. Dominance of Class I Railroads

The railroad industry has always been dominated by Class I railroads. Generically, Class I railroads operate long-haul freight trains carrying a considerable number of freight tons which in turn generate a large amount of ton miles and high total revenues. In contrast, revenues and hence operations of regional and local railroads are considerably lower due to fewer ton miles generated. Figure 8 on page 58 and Figure 9 on page 60 indicate that Class I railroads always have accounted for the main share of total ton miles, total

¹¹⁶ Railroad Facts, 1996, p. 3. Data modified for 01/01/97.

freight revenue, total miles operated, and number of employees. Therefore, this study will focus on Class I railroads.

B. Concentration of Class I Railroads

Concentration has never been unusual in the railroad industry.¹¹⁷ In the past, both potential gains and potential drawbacks of concentration have been scrutinized and their consequences are well known.¹¹⁸ The Staggers Act did not change existing consolidation guidelines in principle.¹¹⁹ Merger approval by the ICC conferred automatic antitrust immunity.¹²⁰ Figure 9 on page 60 shows that the number of Class I railroads has been declining constantly. The drop of Class I railroads in the 1970s can be traced to mergers following bankruptcies and to the redefinition of Class I railroads in 1978 (Figure 9 on page 60). Consolidation has often been a process over several years, starting with partial acquisition, subsequent acquisition of a controlling interest by the parent, and finally a merger into the parent.¹²¹

¹¹⁷ See Conant, 1964.

¹¹⁸ See Footnote 84 on page 43.

¹¹⁹ See Consolidation, Merger, and Acquisition of Control on page 50.

¹²⁰ See Footnote 106 on page 51.

¹²¹ Firm combinations can be classified (1) by the scope of business of the combining firms and (2) by the method of consummating the combination. (1) (a) *Horizontal combination*: The combining firms are located in the same industry and at the same stage of the value chain; (b) *vertical combination*: The combining firms are located at different stages of the value chain (upstream or downstream); (c) *unrelated combination*: There is no direct relation between the combining firms. (2) (a) *Statutory merger*: At least one firm is absorbed into another one and

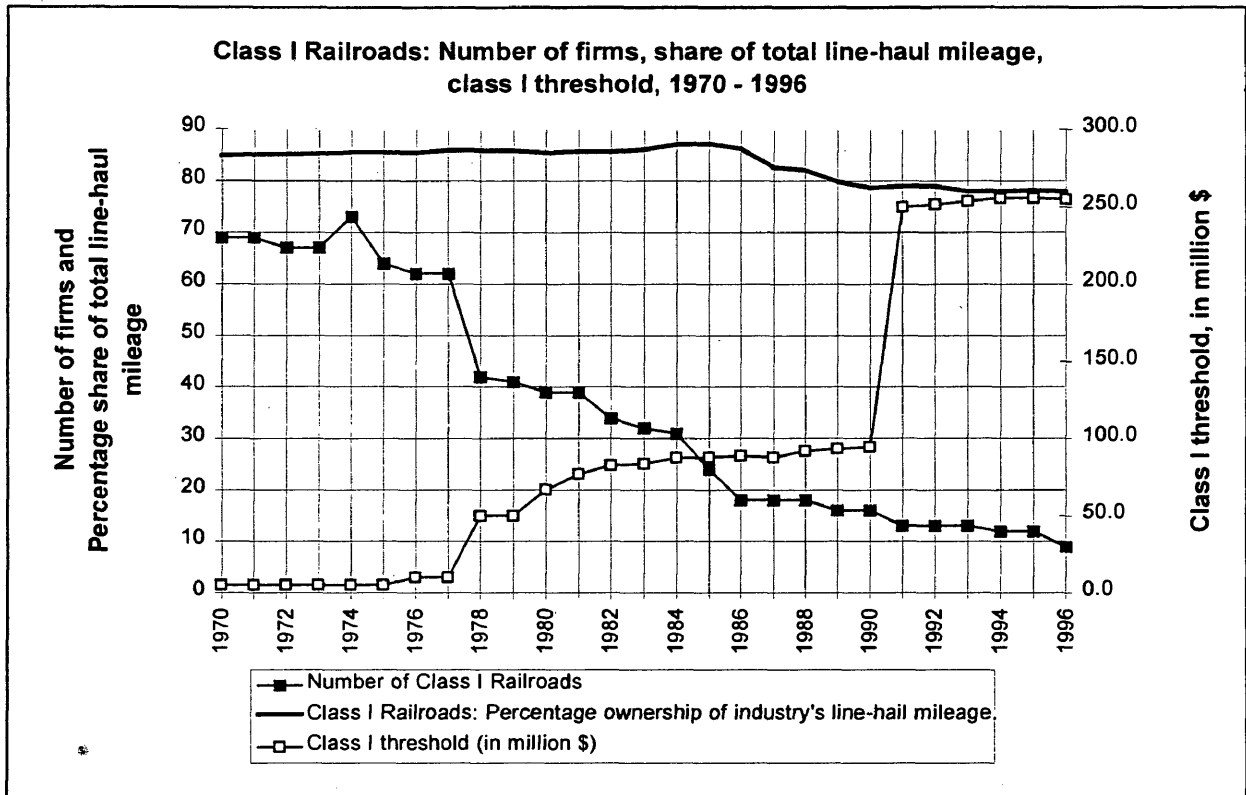


Figure 9: Class I Railroads: Number Of Firms, Share Of Total Line-Haul Mileage, Annual Revenue Threshold For Class I Railroads, 1970 - 1996.¹²²

ceases to exist; (b) *statutory consolidation*: At least one firm is absorbed into a specifically new created firm which is the only remaining firm; (c) *asset acquisition*: If no controlling interest is acquired, the selling firm survives, if a controlling interest is acquired, the selling firm may survive as subsidiary; (d) *stock acquisition*: Both firms survive, the parent has an intercompany investment and may have a controlling interest.

¹²² *Number of Class I Railroads*: The number reflects the number of firms by 12/31 in that year except for the years 1977/78/79. Data for the year 1977 reflect Class I Railroads as of 12/31/76, Data for the year 1978 reflect Class I Railroads as of 03/07/78, data for the year 1979 reflect Class I Railroads as of October 1979. See also Footnote 114. *Share of total line-haul mileage*: Association of American Railroads, PL&E Department, 1997. For explanation see Weight/Distance on page 55. See also Figure 15.

The consolidation trend further continued after 1980. Figure 9 on page 60 indicates that the number of Class I railroads has dropped from 39 to 9 since 1980. However, Class I railroads' share of total line-haul mileage has not changed significantly over these years. In 1970, 69 firms accounted for 85% of the total mileage where in 1996 just 9 firms accounted for 78% of the total mileage. Figure 10 on page 63 and Figure 11 on page 64 show the development of consolidation in more detail. The 69 Class I railroads that existed 1970 have since consolidated into nine Class I railroads or have dropped out of the Class I category (mainly due to class redefinitions). Figure 12 on page 65 depicts the proportions of the nine Class I railroads that presently exist. These firms can be subdivided into the major five and four minor railroads. Four of the five major railroads emerged during the 1980s. The fifth, Conrail, was created in the 1970s by virtue of law following the bankruptcy of the Penn Central Railroad.¹²³ Two of the minor Class I railroads were controlled by the Canadian Railroads.¹²⁴ The consolidation trend did not halt yet. Presently, Conrail is to be shared out among CSX and Norfolk Southern.¹²⁵ In June, 1997, Union Pacific gained an interest in Mexico's North Pacific Railroad which

¹²³ See Regional Rail Reorganization (3-R) Act of 1973 on page 47.

¹²⁴ see Footnote 129 on page 65.

¹²⁵ Carey, 1997.

connects Union Pacific as far as Mexico City.¹²⁶ Facing increased transportation volume in conjunction with NAFTA, this is an important strategic step.

¹²⁶ Omaha World Herald, 06/27/97.

year	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Burlington Northern R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Atchison, Topeka & Santa Fe R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Colorado & Southern Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Fort Worth & Denver Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
St. Louis-San Francisco Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Toledo, Peoria & Western R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Oregon Electric Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Conrail	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Central R.R. Co. of New Jersey	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Erie-Lackawanna Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Lehigh Valley R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Penn Central Transportation Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Reading Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Ann Arbor R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pennsylvania-Reading Seashore Lines	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
CSX Corp.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Seaboard Coast Line R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Baltimore & Ohio R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Chesapeake & Ohio Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Western Maryland Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Louisville & Nashville R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Clinchfield R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Georgia R.R., Lessee Organization	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Richmond, Fredericksburg & Potomac R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Atlanta & West Point R.R. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Western Ry. of Alabama	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Monon R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Grand Trunk Western R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Detroit, Toledo & Ironton R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Duluth, Winnipeg & Pacific Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Central Vermont Ry., Inc.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Detroit & Toledo Shore Line R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Illinois Central R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Gulf, Mobile & Ohio R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Kansas City Southern Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Norfolk Southern	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Southern Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Norfolk & Western Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Central of Georgia Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Alabama Great Southern R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cincinnati, New Orleans & Texas Pacific Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Georgia Southern & Florida Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Illinois Terminal R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Akron, Canton & Youngston R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Soo Line R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Chicago, Milwaukee, St. Paul & Pacific R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Minneapolis, Northfield & Southern Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Union Pacific R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Southern Pacific Transportation Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Chicago & North Western Ry. System	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Denver & Rio Grande Western R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
St. Louis Southwestern Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Missouri-Kansas-Texas R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Missouri Pacific R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Western Pacific R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Northwestern Pacific R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Texas & Pacific Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Chicago & Eastern Illinois R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Missouri-Illinois R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Spokane International R.R. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Figure 10: Class I Railroads ultimately merged into, acquired by or controlled by majority by 1997
Class I Railroads, 1970 - 1997.¹²⁷

¹²⁷ Moody, 1996, editions 1971-1996. A dot indicates that the railroad was listed as Class I railroad by 12/31 in that year. The vertical lines indicate years of major redefinitions of Class I

year	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
Gulfport Transportation Co.																											
Boston & Maine Corp.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Delaware & Hudson Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Maine Central R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Independent Class I Railroads																											
Florida East Coast Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Elgin, Joliet & Eastern Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Pittsburgh & Lake Erie R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Bessemer & Lake Erie R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Duluth, Missabe & Iron Range Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Long Island R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Chicago, Rock Island & Pacific R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Michigan Interstate Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Chicago & Illinois Midland Ry.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Bangor & Aroostook R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Auto-Train Corp.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Canadian Pacific Lines in Maine	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Texas Mexican Ry. Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Green Bay & Western R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Lake Superior Ishpeming R.R.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Monongahela Ry., Co.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					

Figure 11: Class I Railroads Not Merged Into Or Acquired By Other Class I Railroads, 1970 - 1997.¹²⁸

railroads. See also Footnote 122, section Number of Class I Railroads. The Figure shows the ultimate outcome of combinations only, it does not account for intermediate combinations. The company histories were traced for data on combinations. Numbers in parentheses denote page numbers in Moody, 1996 edition, for histories of individual companies: Burlington Northern, Inc. (a1), Burlington Northern Santa Fe Corp. (BNSF) (a15), Illinois Central Corp. (a28), Illinois Central R.R. Co (a39), Kansas City Southern Industries, Inc. (a48), Kansas City Southern Railway Company: (a69), Norfolk Southern Corp. (a76), Norfolk Southern Railway, Inc. (a89), Norfolk and Western Railway Corp. (a101), Union Pacific Corp.: (a10), Missouri Pacific R.R. Co. (a27), Union Pacific R.R. Co. (a133), Soo Line Corp. (a215), Atchison, Topeka & Santa Fe Ry. Co. (a403), Santa Fe Pacific Corp. (a455), Grand Trunk Corp. (a243), Grand Trunk Western Railroad Co. (a 245), CSX Corp. (a421), Conrail, Inc. (a416). R.R. = Railroad, Ry. = Railway.

¹²⁸ Moody, editions 1971-1996. A dot indicates that the railroad was listed as class I railroad by 12/31 in that year. The vertical lines indicate years of major redefinitions of Class I railroads. See also Footnote 122, section Number of Class I Railroads. Company histories were traced for data on combinations (Moody, various editions). R.R. = Railroad, Ry. = Railway.

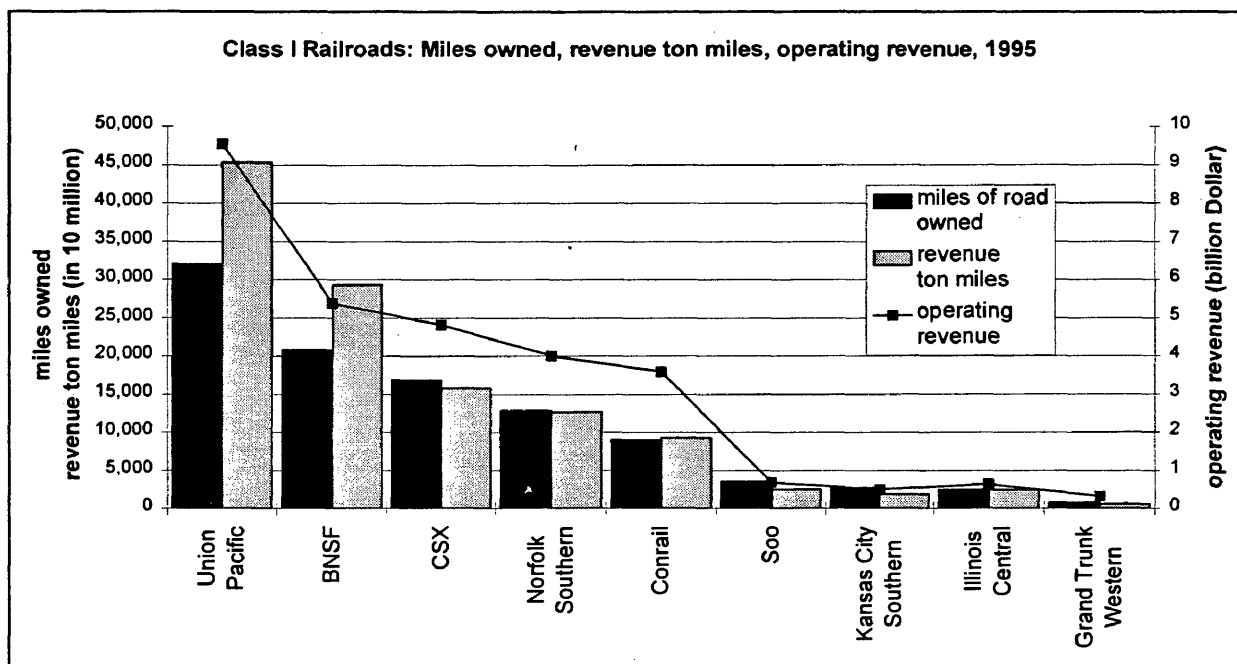


Figure 12: Class I Railroads: Miles Of Road Owned, Revenue Ton Miles, Operating Revenue, 1997.¹²⁹

Figure 12 on page 65 does not include Amtrak because it is primarily a passenger railroad. Amtrak was created in 1970 to take over the remaining intercity passenger service.¹³⁰ Amtrak does not own track except the “Northeast Corridor” and some branchlines in Pennsylvania and Massachusetts.¹³¹ Outside its trackage, passenger trains are operated under trackage rights agreement with

¹²⁹ Railroad Facts, 1996, p. 68-77. 1995 data. Data for *Union Pacific* is calculated by adding data for Union Pacific and Southern Pacific which was merged into Union Pacific in August 1996. The *Grand Trunk Western Railroad Company* was a wholly owned subsidiary of *Canadian National Railway Company* (since 1971). In 1995 it was merged into its parent. The *Soo Line* is a wholly owned subsidiary of *Canadian Pacific Railway* (since 1990). (McGonigal, 1996).

¹³⁰ See

Rail Passenger Service Act of 1970 on page 46.

¹³¹ Dooley, 1994, p. 129. The Northeast Corridor is the railroad between Washington and Boston. Amtrak owns 750 miles of track and operates 24,500 miles of track. Its 1995 revenues were \$1.25 billion (Railroad Facts, 1996, p. 78). For an overview of Amtrak's operations, see Dooley, 1994, Chapter 9.

the cooperating railroads. Railroads are required to provide their tracks to Amtrak at reasonable rates for operation of passenger services. Besides intercity service Amtrak provides commuter service in some metropolitan areas.¹³²

1. The Herfindahl-Hirschman Index

The Herfindahl-Hirschman Index (HHI) is a statistical measure of market concentration and a proxy for market power.¹³³ It is used by the Department of Justice (DoJ) and by the Federal Reserve Board in the analysis of competitive effects of mergers. The HHI accounts for the number of firms as well as their relative size (market share) in the relevant market (with respect to product and geographic area). The HHI asserts market power increases geometrically, not linearly, with increase in market share. The HHI is calculated by squaring the market shares of all firm in the relevant market and then summing the squares, as follows:

$$HHI = \sum_{i=1}^n (MS_i)^2 .$$

A HHI approaching zero means perfect competition because this would mean there are very many firms, all with very small market shares. In contrast, a HHI of 10,000 means pure monopoly because one firm with 100% market share

¹³² Dooley, 1994, p. 144.

¹³³ Rhoades, 1986.

has an HHI of 10,000. However, the HHI should be applied with caution.

Although it weights larger market shares heavier than small ones (by squaring market shares), the correlation between squared market share and anticompetitive effects has been chosen arbitrarily. Secondly, the HHI is often applied improperly by basing it on national market shares rather than on relevant (local) market shares. To illustrate, assume the 1995 market shares for Class I railroads: at the national level, the revenue ton-mile based HHI would be 2384. However, there is no place in the U.S. that is served by all Class I railroads. Furthermore, since railroads operate on different road networks, not every railroad that serves a particular location will serve the destination of the shipment which further shrinks the relevant market. Hence, the real HHI faced by customers is always higher than the national one. For example, a local market served by two railroads with equal market shares (assuming both railroads serve the same destinations) would yield an HHI of 5,000.

In 1968, the Department of Justice (DoJ) published formal guidelines for horizontal mergers which were revised in 1982, 1984, 1992, and 1997.¹³⁴ The guidelines reflect the enforcement policy of the DoJ and the Federal Trade Commission (FTC) concerning horizontal mergers subject to section 7 of the Clayton Act, to section 1 of the Sherman Act, or to section 5 of the Federal Trade

Commission Act.¹³⁵ The focus is on prevention of market power, which is defined as “the ability profitably to maintain prices above competitive levels for a significant period of time.”¹³⁶ Market power is seen as a function of market concentration. Therefore, the DoJ and the FTC apply the HHI in determining the level of concentration. Individual market shares are based on “the best indicator of firms’ future competitive significance.”¹³⁷ The guidelines account for the relevant market which is defined by product and geographic area. The general standards of the guidelines are:¹³⁸

1. Where the post-merger HHI is less than 1,000 (“unconcentrated market”), the merger will be challenged only in “extraordinary circumstances”.
2. Where the post-merger HHI is between 1,000 and 1,800 (“moderately concentrated market”), and the merger increases the HHI by more than 100 points, the government is “likely” to challenge the merger unless other factors suggest “the merger is not likely to substantially lessen competition.”
3. Where the post-merger HHI is over 1,800 (“highly concentrated market”), and the merger increases the HHI by more than 50 points, the government is

¹³⁴ U.S. Department of Justice, 1997. In the context of these guidelines, the term “merger” encompasses all types of firm combinations. See Footnote 121 on page 59.

¹³⁵ Section 7 of the *Clayton Act* (15 U.S.C. § 18) declares illegal stock or asset acquisition by any person or business of another “where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly”. For section 1 of the *Sherman Act* see Footnote 44 on page 29. Section 5 of the *Federal Trade Commission Act* (15 U.S.C. § 45) declares unlawful unfair methods of competition and unfair or deceptive acts or practices in or affecting commerce.

¹³⁶ U.S. Department of Justice, 1997, p. 2.

¹³⁷ U.S. Department of Justice, 1997, p. 14. If firms are distinguished primarily by differentiation of their products, then dollar sales generally will be used. If firms are distinguished primarily on the basis of their relative advantages in serving different buyers or groups of buyers, then unit sales generally will be used.

¹³⁸ U.S. Department of Justice, 1997, p. 16.

“likely” to challenge the merger unless other factors suggest “the merger is not likely to substantially lessen competition.”

Judgments based on HHI values can be influenced by the following factors:

A. Collusion

Ease of collusion makes anticompetitive post-merger effects more likely and hence will impede merger approval. Ease of collusion is examined through proxies.

B. Entry

The Department of Justice finds: “A merger is not likely to create or enhance market power or to facilitate its exercise, if entry into the market is so easy that market participants, after the merger, either collectively or unilaterally could not profitably maintain a price increase above premerger levels. Such entry likely will deter an anticompetitive merger in its incipiency, or deter or counteract the competitive effects of concern.”¹³⁹ Entry is easy if it is (1) *timely*, (2) *likely*, and (3) *sufficient* to deter anticompetitive behavior. An entry alternative is considered to be timely if a significant impact on prices in the relevant market can be achieved within two years from initial planning. An

¹³⁹ U.S. Department of Justice, 1997, p. 25.

entry alternative is considered to be likely if it would be profitable at premerger prices and if the entrant could secure such prices (i.e., the entrant faces the demand corresponding to his price). An entry alternative is considered to be sufficient if (1) the entrant has access to essential assets in the same way as the incumbent does and (2) the character and scope of the entrant's products is fully responsive to local sales opportunities created by the merger.

C. Efficiencies

Greater post merger efficiencies facilitate merger approval if (1) efficiencies are *cognizable* and (2) of a character and magnitude such that the merger is not likely to be anticompetitive in any relevant market.¹⁴⁰

D. Failing Firm

Merger approval is facilitated if one of the merging firms is failing and will hence exit the market anyway.

¹⁴⁰ Cognizable efficiencies are efficiencies that can (1) unambiguously be traced to the merger (*merger-specific efficiency*) and (2) do not arise from anticompetitive reductions in output or service. The second condition for Cognizability was excluded in the 1992 merger guidelines. In the 1982 guidelines, efficiencies had to be shown by "clear and convincing (in an engineering sense)" evidence. Greater efficiency was generally excluded from the 1968 guidelines (Coate, 1994, p. 48n).

Table III on page 71 shows the area of operation of Class I railroads. The railroad HHI is calculated for different regions in Table IV on page 72 based upon the data found in Figure 12 on page 65. Amtrak has been included since it competes with freight railroads in the express freight sector.¹⁴¹ A HHI calculated for large regions, such as shown in Table IV on page 76, certainly does not accurately reflect the real situation any one local shipper. A specific shipper may face a competitive regional market, but rail service at the shipper's door most likely is monopolistic.

Railroad	Area of operation
Amtrak	United States
BNSF	West of Missouri River
Conrail	Official Territory ¹⁴²
CSX	East of Missouri River
Grand Trunk Western	Michigan/Great Lakes
Illinois Central	Chicago-New Orleans
Kansas City Southern	Kansas City-Gulf Coast
Norfolk Southern	East of Missouri River
Soo Line	Minnesota/Lake Michigan States
Union Pacific	West of Missouri River

Table III: Class I Railroads: Area Of Operation.¹⁴³

¹⁴¹ Wall Street Journal, 07/30/97.

¹⁴² The Official Territory encompasses the New England, the Mid Atlantic, and the Great Lakes States. Friedlaender, 1981, p. 110.

Region	Serving Railroads	HHI _R	HHI _R ^A	HHI _T
United States	BNSF, Conrail, CSX, GTW, IC, KCS, NFS, Soo, UP	1995	1853	2384
West of Missouri River	BNSF, UP	5388	4647	5229
Official Territory (before sharing out of Conrail)	Conrail, CSX, NFS	3384	2877	3482
Official Territory (after sharing out Conrail)	CSX, NFS	5022	4229	5033
East of Missouri River		5042	4023	5058
Gulf Coast	BNSF, IC, KCS, UP	4667	4078	4676
State of Ohio	CSX, NFS, Conrail, Soo, IC, GTW,	2689	2335	2706

Table IV: Class I Railroads: HHI By Selected Regions.¹⁴⁴

The results shown in Table IV on page 72 indicate that the HHIs for all regions are well above the DoJ HHI threshold of 1,800 where anticompetitive effects are likely to be prevalent. Regarding the proposed sharing out of Conrail, the increase in the HHI will be more than 30 times higher than tolerable under the DoJ merger guidelines of an increase in HHI of 50. The results further confirm the theoretical consideration that regional HHIs tend to be higher than global ones. This is crucial insofar that the HHIs will be even higher when calculated for specific local markets since the local market HHI for rail is likely to be 10,000.

¹⁴³ Based on McGonigal, 1996.

The immense deviation from existing antitrust guidelines in favor of concentration can be traced to the general antitrust attitude during the Reagan administration. No administration before Reagan had enforced antitrust regulations in such a pro-merger way. The Reagan administration allowed mergers the guidelines would appear to prohibit.¹⁴⁵ Figure 13 on page 74 and Figure 14 on page 75 reveal that in these years the number and the total value of business combinations have been extraordinarily high. Eisner holds that the policy change in antitrust enforcement in the 1980s was less a product of presidential or congressional politics than a product of changes within the bureaucracy initiated well before the 1980 elections.¹⁴⁶ This is credible insofar as much of the deregulation movement in the transportation industry was initiated by the Carter administration, and took place before 1982 (see Table II on page 39).

The trend towards more liberal antitrust policy in the 1980s also is reflected in the merger guidelines. The 1982 guidelines provided a more liberal approach to merger enforcement than the 1968 guidelines, and the 1984, and 1992 amendments continue this liberalizing trend. More specifically, when compared to the 1968 guidelines, the 1982, 1984 and 1992 guidelines set forth a

¹⁴⁴ Data based on data in Figure 12 on page 65. HHI_R is based on annual revenue, where HHI_R^A includes Amtrak. HHI_T is based on annual revenue ton miles.

¹⁴⁵ Coate, 1994, p. 61.

much higher threshold for identifying concentrated markets, give less significance to concentration analysis, and give more weight to an analysis of other factors, such as entry and efficiencies.¹⁴⁷

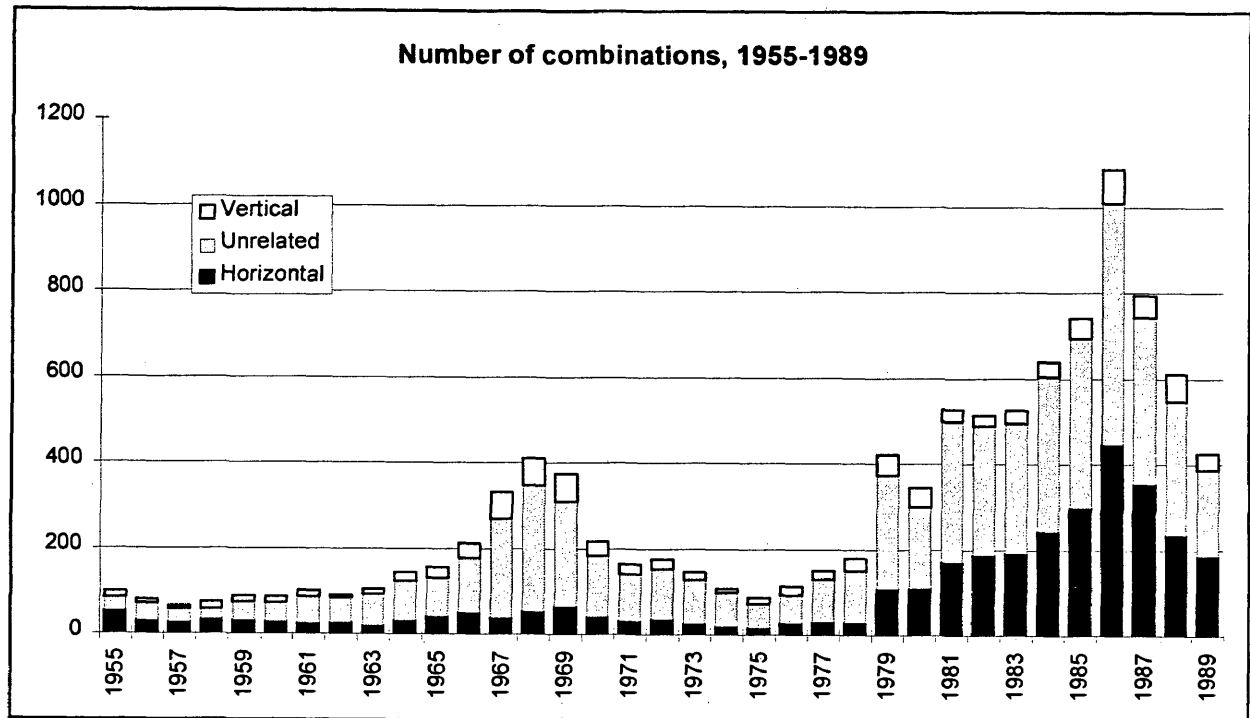


Figure 13: Number Of Business Combinations, 1955 - 1989.¹⁴⁸

¹⁴⁶ Eisner, 1994, p. 75.

¹⁴⁷ Thompson, 1996.

¹⁴⁸ Blair, 1993, p. 63. Blair classified combinations on the basis of the primary industry codes of the combining firms (SIC).

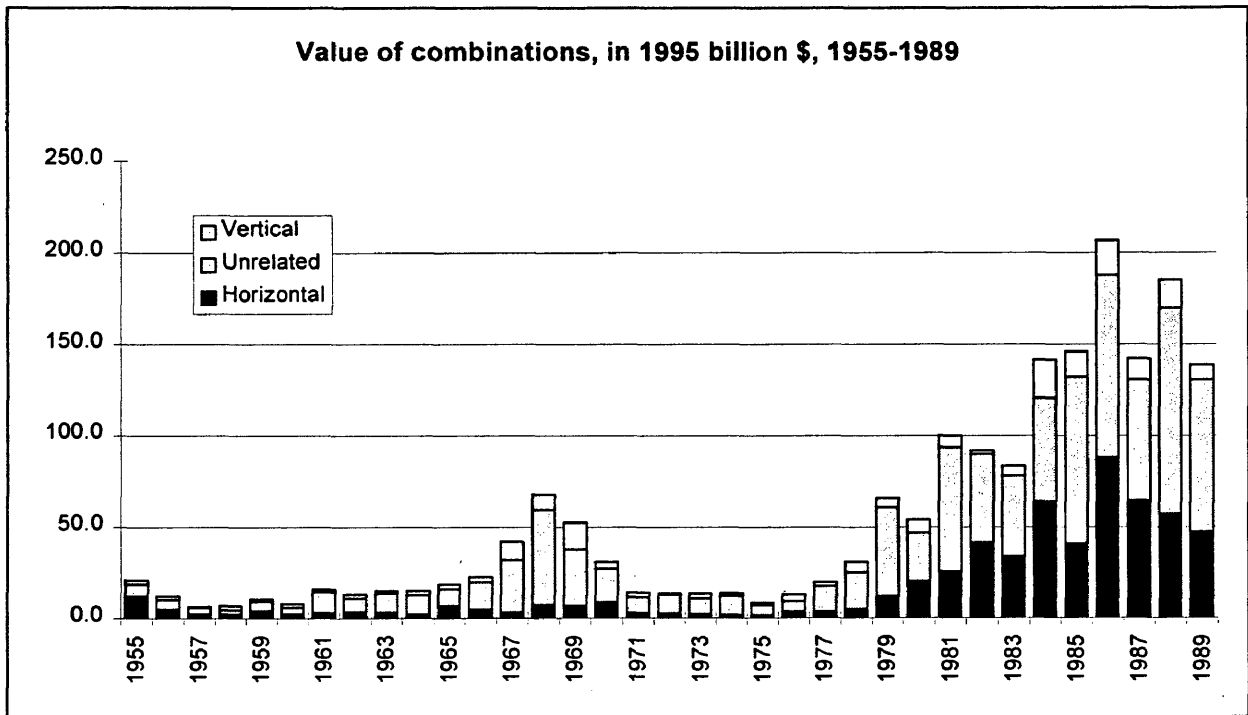


Figure 14: Value Of Business Combinations, In 1995 Dollar, 1955 - 1989.¹⁴⁹

¹⁴⁹ Blair, 1993, p. 63. Data adjusted for 1995 \$ (by GDP deflator). See also Footnote 148.

C. Operations

Generally, the profitability of railroads can be determined by the formula

$$\text{profitability} = \frac{\text{quantity of revenue generating items}}{\text{quantity of cost generating items}}$$

$$= \frac{\text{revenue ton miles}}{\text{length of road} * \text{trainhour} * \text{employee}}$$

Recommendations to increase profitability are summarized in Table V on page 76. These are derived from the general formula for profitability.

Technically, raising rates is also an alternative to increase profitability, but a highly unpopular one which should not be considered in the presence of other alternatives.

In the following, it will be examined what changes railroad operation were

Increase	Decrease
load per car	length of road owned
number of cars per train	transit time of trains
length of haul	number of employees

Table V: Determinants Of Railroad Profitability.

subject to after deregulation and to what extent railroads were able to increase profitability.

Since 1976 Class I railroads have streamlined their road network considerably. Miles of road owned have been reduced by almost one half (see Figure 15 on page 79). These reductions have been realized only in parts through abandonment. A large part of the track has been sold off to newly established *Short-Line Railroads* operating in low traffic density areas. Their different cost structure makes operations profitable in those areas where business is unprofitable for Class I railroads. Between 1980 and 1986, 41% of the mileage divested by Class I railroads was taken over by newly established short-line railroads.¹⁵⁰

By now, short-lines operate about 20% of the industry's track.¹⁵¹ Between 1980 and 1989, 224 new local or regional railroads have been established.¹⁵² In 1996, there were about 60 families of short lines across the country. The largest short-line operator, RailTex Inc., operates 26 short-line railroads.¹⁵³ Generally,

¹⁵⁰ Rockey, 1987. See also Figure 15 and Figure 8. For history, statistics and analysis of short-line Railroads see also Due (1984) and Horn (1989) and Wolfe (1989).

¹⁵¹ See Figure 8 on page 58 and Figure 9 on page 60.

¹⁵² Wolfe, 1989, p. 13.

¹⁵³ DiBenedetto, 1996. See also Figure 8.

short-lines and line-haul railroads form a *hub-and-spoke system*.¹⁵⁴ That is, short-lines originate at line-haul terminals and spread across the surrounding area, providing rail connection to the hinterland and consolidating freight for line-haul railroads. This way, short-lines provide one third of the business for Class I railroads.¹⁵⁵

Between 1976 and 1982, Class I railroads made considerable investments in (remaining) way and structures (see Figure 16 on page 80).

The number of accidents decreased significantly (see Figure 17 on page 81) which indicates higher quality of transportation by railroad.

The average length of haul has distinctly increased since deregulation (Figure 18 on page 82).

The increase can be explained by the concentration of Class I railroads, especially the large number of end-to-end mergers which facilitate longer, uninterrupted hauls.¹⁵⁶

¹⁵⁴ See Figure 29 on page 104.

¹⁵⁵ Lafferty, 1996.

¹⁵⁶ For an econometric analysis of types of mergers, see Harris, 1983; and Levin, 1979. End-to-end mergers in contrast to parallel mergers (also denoted side-by-side mergers) are found to increase market share and quality of service, but not necessarily to reduce costs. See also Footnote 85 on page 44. Different from Friedlaender's assumptions, end-to-end merger have proven to be the preferable type of merger. This is comprehensible insofar that parallel mergers, to achieve reduction of excess capacity, imply substantial abandonment which might not be feasible in practice. Hence, parallel mergers rather create excess capacity than reducing it. On

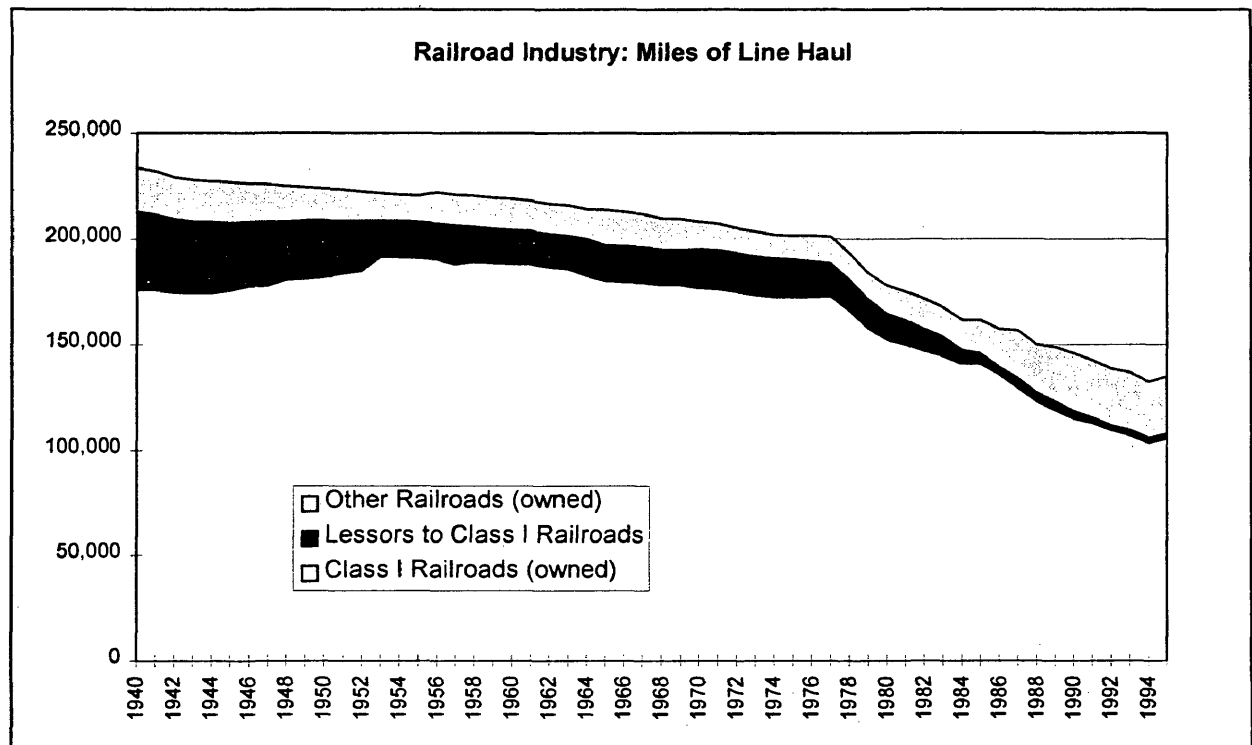


Figure 15: Industry Miles Of Line-Haul, 1940-1995.¹⁵⁷

the other hand, end-to-end merger extend the railroad's sphere of influence and its territory and yields more efficient and less costlier operations (through reduction of interchanges). These effects may

may offset drawbacks from additional capacity.

¹⁵⁷ Association of American Railroads, PL&E Department, 1997. For explanation see Weight/Distance on page 55.

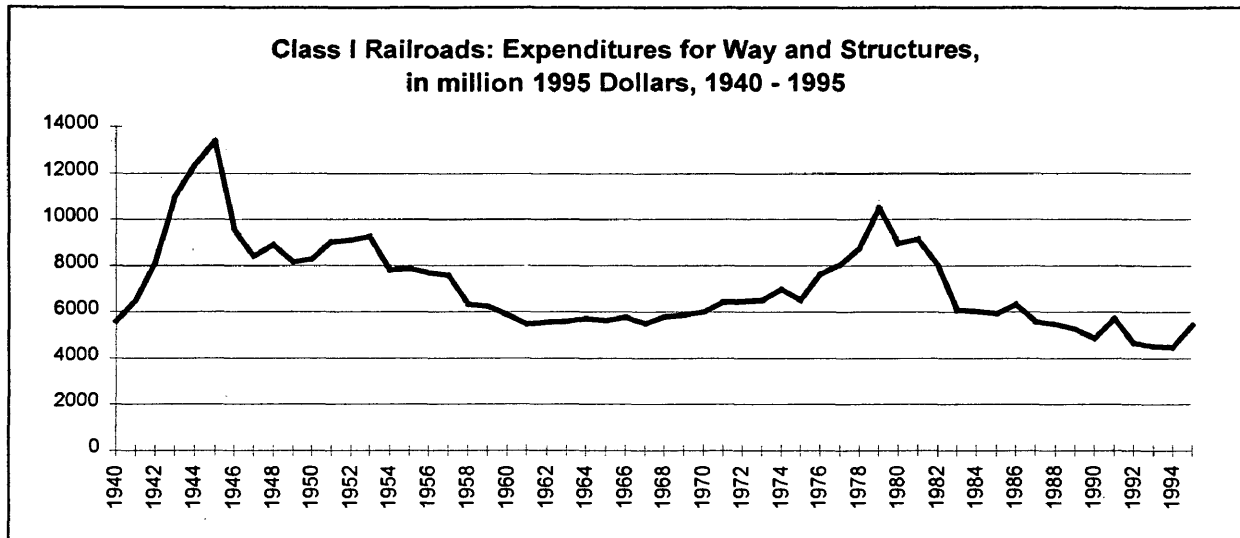


Figure 16: Class I Railroads: Expenditures For Way And Structures, In 1995 Dollars, 1940 - 1995.¹⁵⁸

¹⁵⁸ Moody, 1995, p. a20. *GDP deflator*. See United States Government Printing Office, 1997.

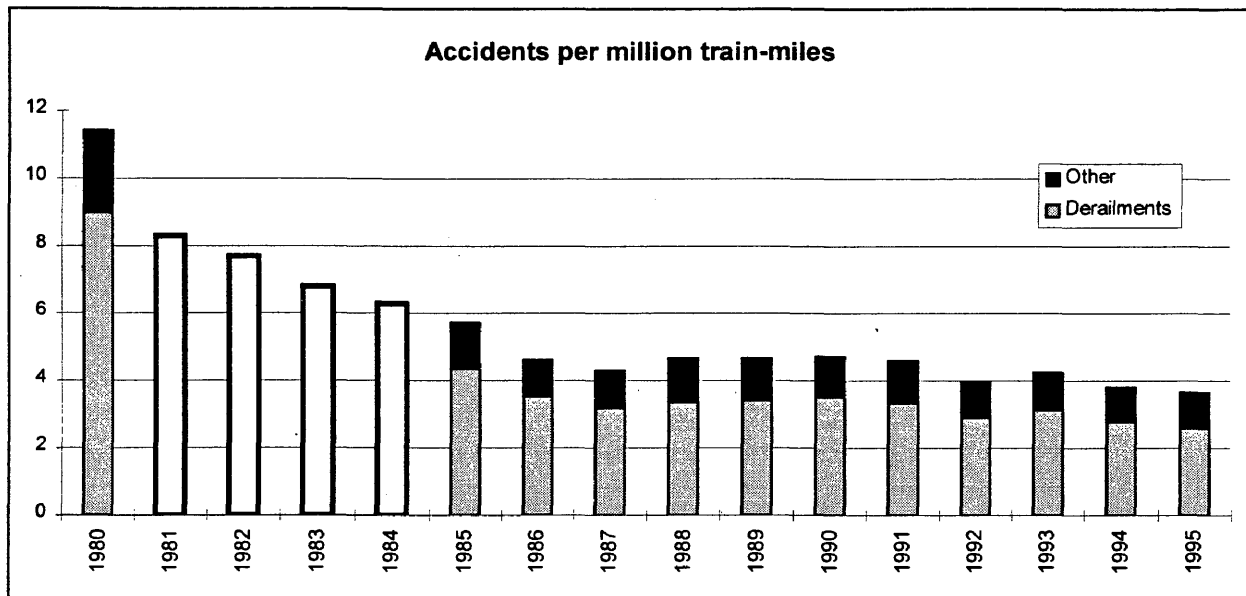


Figure 17: Number Of Rail Accidents Per Million Train-Miles,¹⁵⁹ 1980-1995.¹⁶⁰

¹⁵⁹ For explanation, see Weight/Distance on page 55.

¹⁶⁰ Railroad Facts, 1996, p. 63. No separate data is available for derailments in the years 1981-1984. Data cover all railroads.

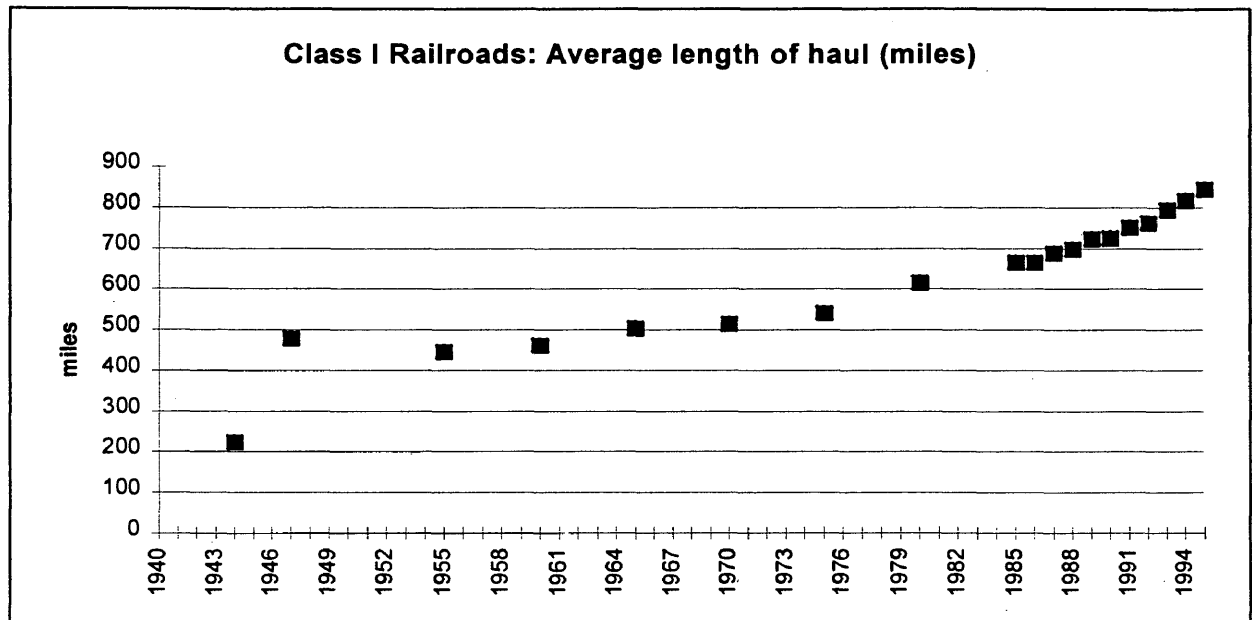


Figure 18: Class I Railroads: Average Length Of Haul, 1940 - 1995.¹⁶¹

Moreover, the longer the haul, the larger is the competitive advantage of the railroad over the truck. The break-even distance where railroad service becomes more profitable than truck service is about 500-700 miles.¹⁶² End-to-end mergers enabled the railroads to further extend their advantage in hauling heavy load over long distances.

¹⁶¹ Railroad Facts, 1996, p. 36.

¹⁶² United States General Accounting Office (GAO), 1993, p. 23. See also The Economics of Intermodal Transportation on page 102.

Figure 19 on page 83 indicates that total freight revenue tons originated by Class I railroads have declined after deregulation (only revenue tons of coal and chemicals and plastics have increased).¹⁶³

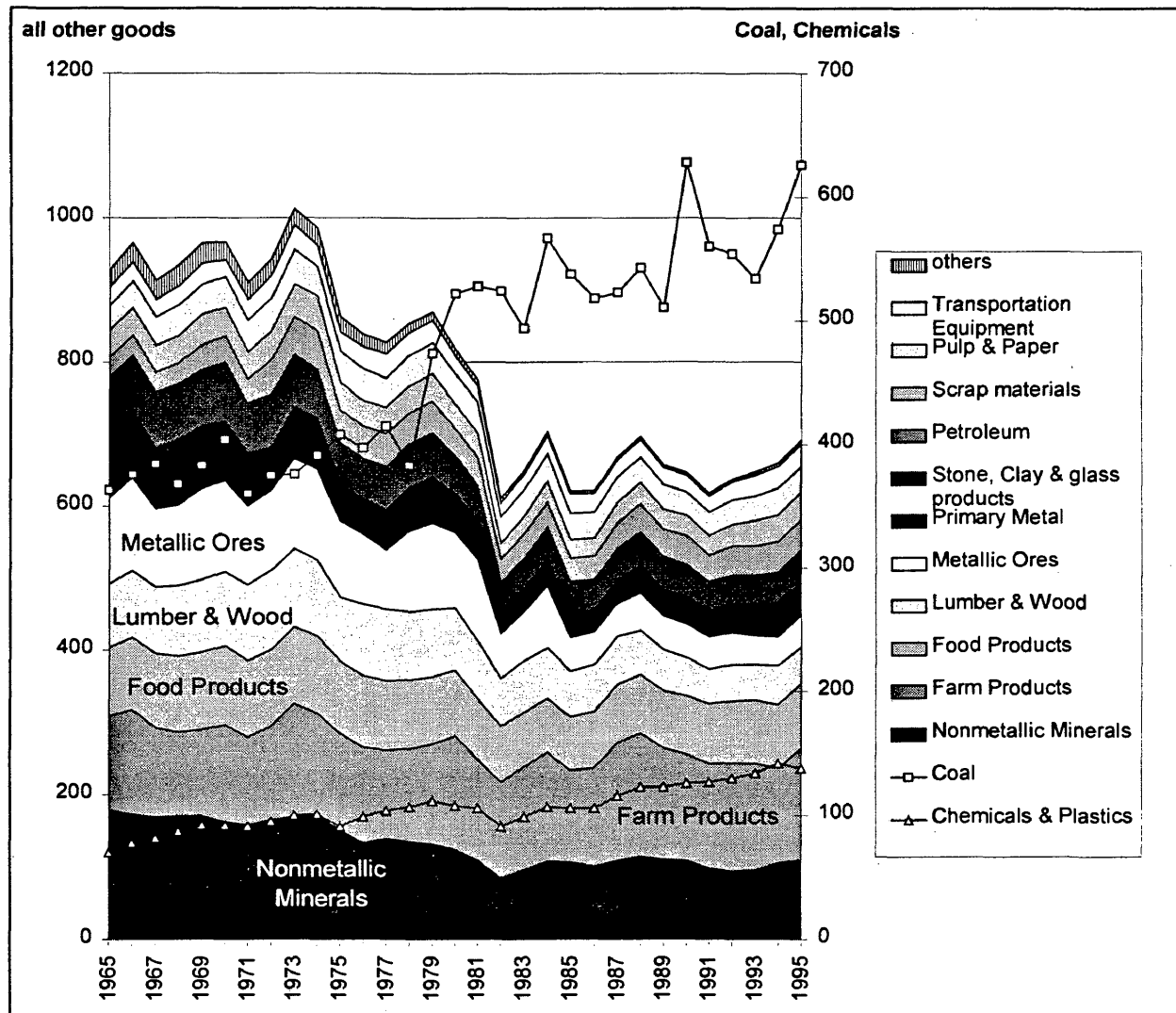


Figure 19: Class I Railroads: Freight Revenue Tons Originated, With Respect To Goods Carried, In Million Tons, 1965 - 1995.¹⁶⁴

¹⁶³ The considerable increase in revenue ton-miles of coal can be attributed to the discovery of the large deposits of low-sulfur coal in the Powder River Basin in Wyoming in the 1970s.

This implies, assuming costs of input factors have kept constant, that expenditures for loading and unloading of trains have also decreased. In comparison, the number of revenue ton miles - the basis for freight revenue - has increased (Figure 20 on page 84).

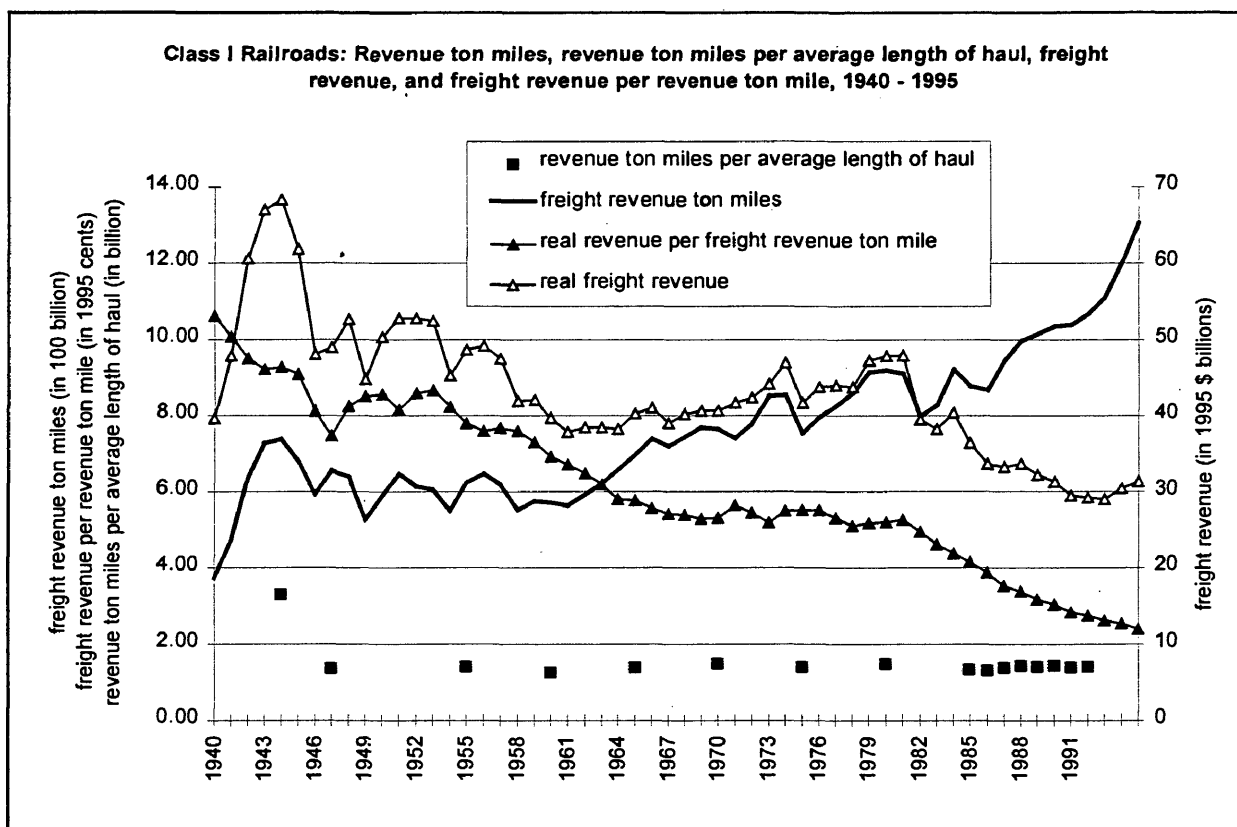


Figure 20: Class I Railroads: Freight Revenue Ton Miles, Revenue Ton Miles Per Average Length Of Haul, Total Freight Revenue, And Freight Revenue Per Ton-Mile, 1940 - 1995.¹⁶⁵

¹⁶⁴ Moody, 1996, pp. a10-a12. "others" consist of machinery, electrical equipment, fabricated metal products, and freight forwarder traffic.

¹⁶⁵ Freight revenue ton-miles: Moody, 1996, p. a5, or Moody, 1996, p. a2, and Railroad Facts, 1996, p. 27 (not all years); revenue ton miles per average length of haul: (calculated); total freight revenue: Railroad Facts, 1996, p. 13, missing data are calculated (freight revenue ton miles times freight revenue per ton mile), calculations match data where available; freight revenue per ton

Since the number of tons originated has actually decreased, the increase in revenue ton miles must be caused by an increase in the average length of haul (Figure 18 on page 82). This is confirmed by the quotient of revenue ton miles and average length of haul which is constant over the years (Figure 20 on page 84).¹⁶⁶

Average revenue tons per train load have increased (Figure 21 on page 86) where average tons per carload have not changed.¹⁶⁷ That is, trains have become longer (more cars per train). This is in opposition to improved service since it implies a reduced train frequency.

mile: Moody, 1996, p. a5 and Railroad Facts, 1996, p. 30. Financial data are adjusted for 1995 Dollars (by GDP deflator).

¹⁶⁶ "Revenue ton miles per average length of haul" do not necessarily have to be equal to "revenue tons originated" because the data for "average length of haul" is not as accurate as data for "revenue ton miles" since it is not weighted by *tons carried per haul (train)*. That is, a train consisting of 10 cars contributes as much to "average length of haul" as a train consisting of 100 cars hauled over the same distance does. On the other hand, "revenue ton miles" accurately reflect tons hauled over distance).

¹⁶⁷ Railroad Facts, 1996, p. 37.

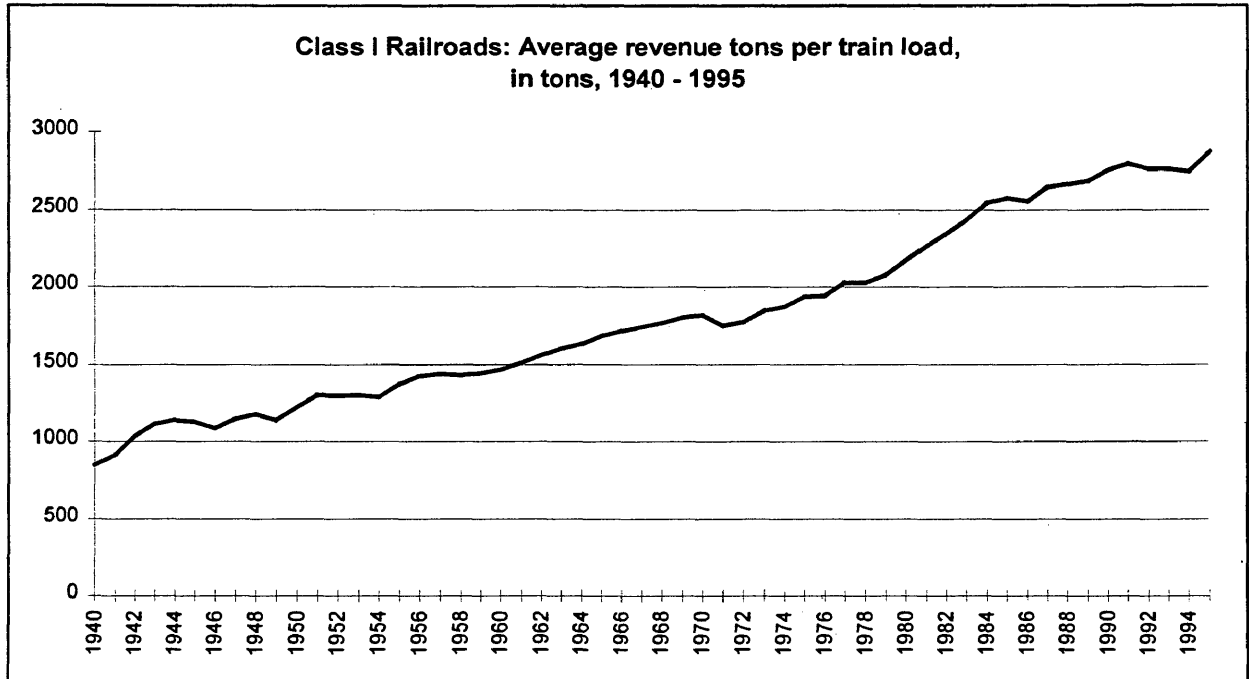


Figure 21: Class I Railroads: Average Revenue Tons Per Train Load, 1940 - 1995.¹⁶⁸

The number of employees and hence total annual compensation have been reduced by 25% between 1980 and 1982 and by another 25% since 1982 (Figure 22 on page 87). The drop in the number of employees was mainly due to reduction in crew sizes.¹⁶⁹ However, compensation per employee has increased. This was due to an increased share of higher qualified employees.

¹⁶⁸ Moody, 1996, p. a2, and Railroad Facts, 1996, p. 37 (not all years).

¹⁶⁹ Keaton, 1991. See also MacDonald, 1996.

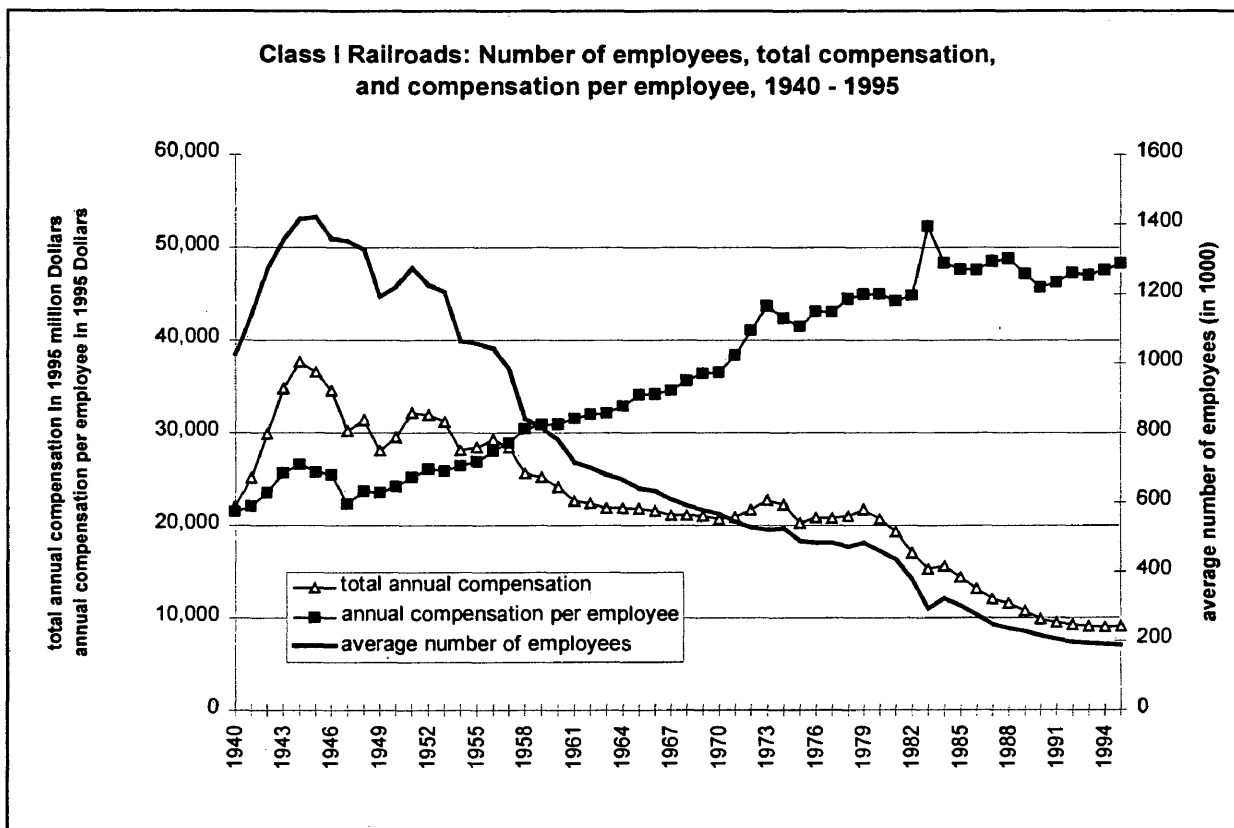


Figure 22: Class I Railroads: Number Of Employees, Total Compensation, And Compensation Per Employee, 1940 - 1995.¹⁷⁰

¹⁷⁰ *Total annual compensation*: Moody, 1996, p. a21, or Moody, 1996, p. a25, and Railroad Facts, 1996, p. 55 (not all years); *annual average number of employees*: Moody, 1996, p. a25, and Railroad Facts, 1996, p. 55 (not all years); *annual compensation per employee*: Calculated (total annual compensation divided by average number of employees); Financial data are adjusted for 1995 Dollars (by GDP deflator).

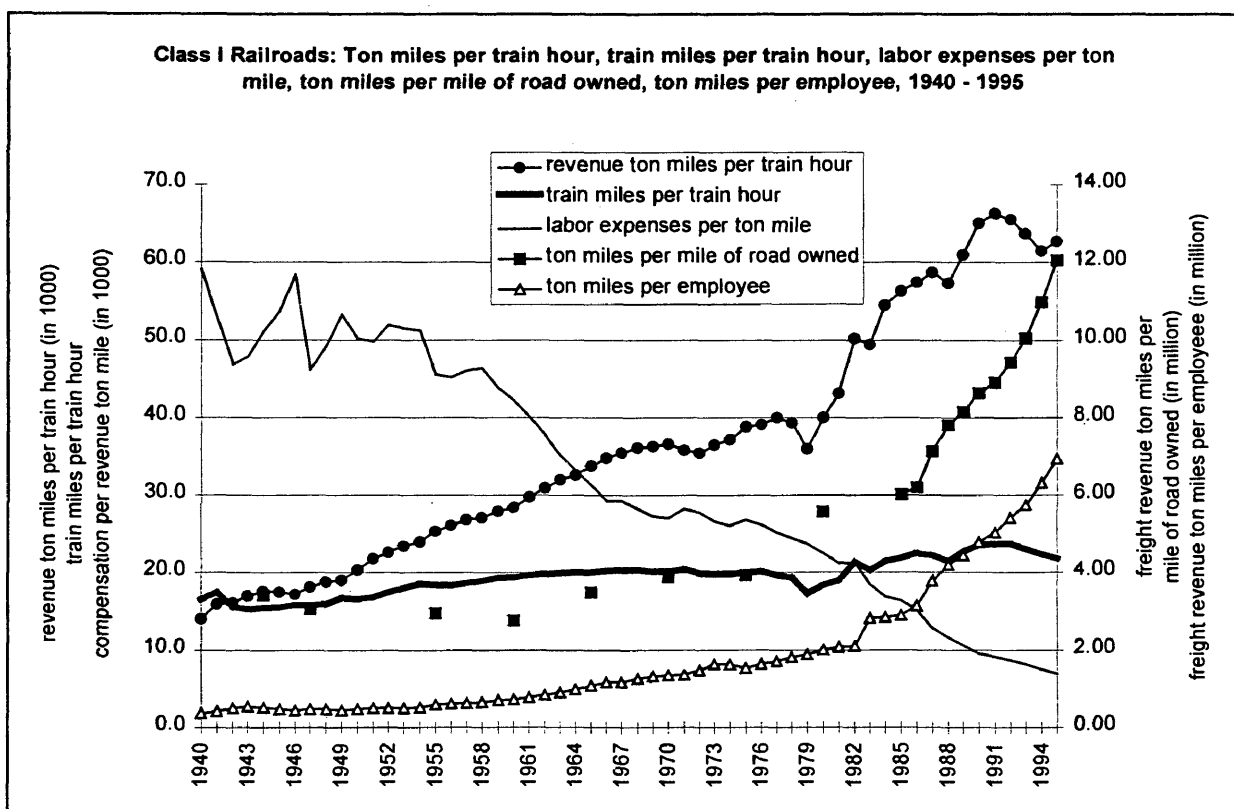


Figure 23: Class I Railroads: Net Ton Miles¹⁷¹ Per Train Hour, Train Miles Per Train Hour, Labor Expenses Per Revenue Ton Mile, Revenue Ton Miles Per Mile Of Road Owned (Traffic Density), Revenue Ton Miles Per Employee, 1940 - 1995.¹⁷²

¹⁷¹ A *net ton mile* is equal to a revenue ton mile including exclusive work equipment and motorcar trains. In 1995, Class I railroads carried 1,305,688 million revenue ton miles and 1,315,381 million net ton miles. (Railroad Facts, 1996, p. 38) Therefore, for the purpose of this study, both numbers can be treated to be equal.

¹⁷² *Net ton miles per train hour*: Moody, 1996, p. a22, and Railroad Facts, 1996, p. 38 (not all years). Figures for 1980 and beyond are not directly comparable to earlier years because of an STB definitional change requiring the inclusion of terminal delay in counting train hours. That is, in terms of the former definition of revenue ton miles per train hour, figures for 1980 and beyond are actually higher. *Train miles per train hour*: Calculated (revenue ton miles per train hour divided by average revenue tons per train load). *Labor expenses per revenue ton mile*: calculated; *revenue ton miles per mile of road owned*: (calculated); *revenue ton miles per employee*: (calculated). Financial data are adjusted for 1995 Dollars (by GDP deflator).

Figure 20 on page 84 indicates that total freight revenue and freight revenue per ton-mile has decreased significantly since deregulation. Although freight revenue per ton mile is not an exact surrogate for freight rates because it is affected by changes in traffic composition and length of haul, it does record the level of revenue received by railroads for providing the basic transportation service, which is hauling of weight over distance.¹⁷³ However, the increase in ton-miles after deregulation can be attributed to an increase in the average length of haul. The number of tons originated has declined, as has total real freight revenue. Real freight revenue per ton originated has increased since deregulation (Figure 24 on page 90). Marginal costs of hauling freight over an extra mile are low compared to costs of loading and unloading. Thus, the increase in length of haul allowed railroads charge more per haul at nearly unchanged costs.

¹⁷³ Railroad Facts, 1996, p. 30.

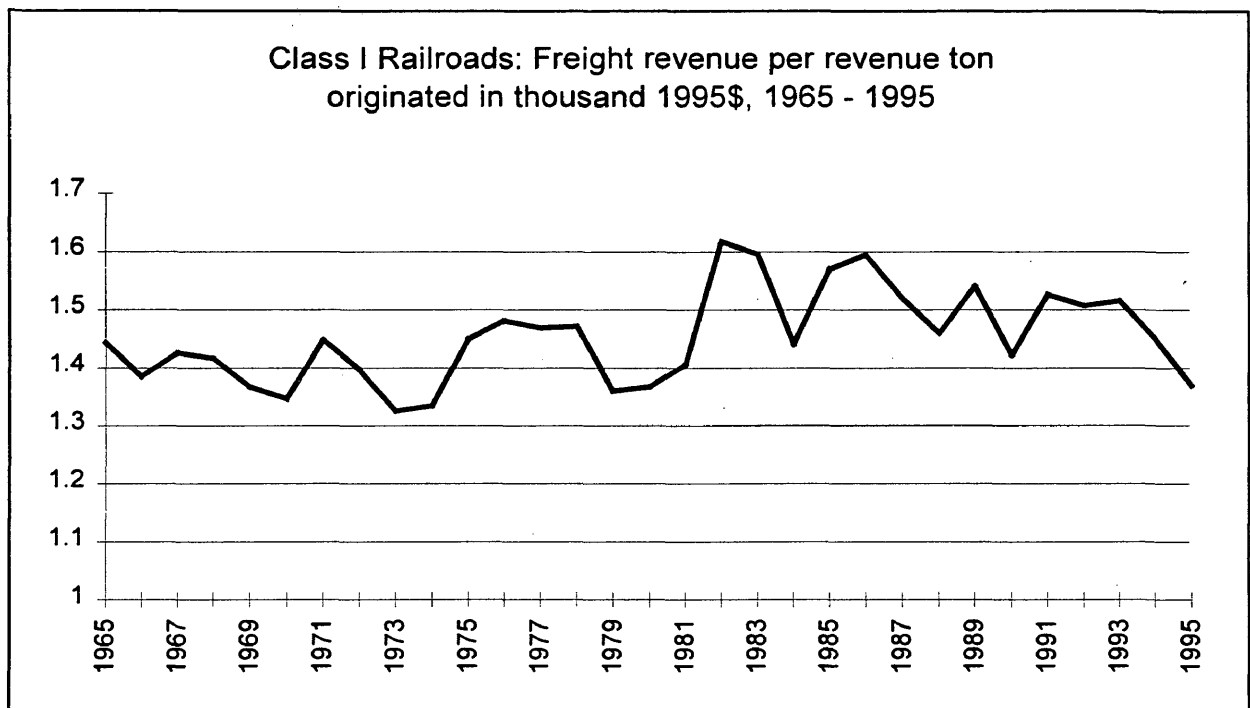


Figure 24: Class I Railroads: Freight Revenue Per Revenue Ton Originated In Thousand 1995 Dollar, 1965 - 1995.¹⁷⁴

Operational efficiency increases of Class I railroads are depicted in Figure 23 on page 88. It shows that revenue ton miles per train hour (speed), per mile of road owned (traffic density), and per employee (productivity) have increased significantly since deregulation. However, the actual speed of *trains* has not been increased. The increase in revenue ton miles per train hour is a sole result of longer trains. Figure 25 on page 91 summarizes the operational efficiency increases of Class I railroads. Operational efficiency has increased nominally by

almost 600% since 1980. Taking into account that real compensation per employee has increased and revenue per ton mile has decreased yields a real operational efficiency increase of 350% since 1980.

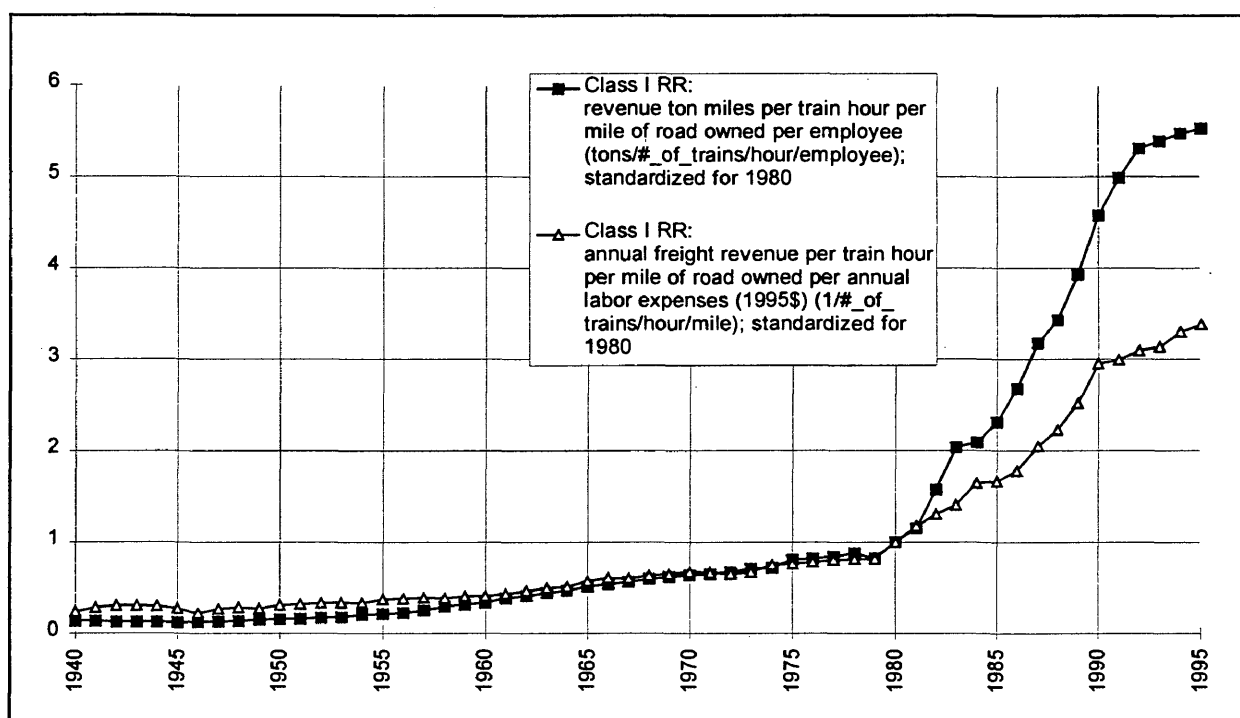


Figure 25: Class I Railroads: Revenue Ton Miles Per Train Hour Per Mile Of Road Owned Per Employee, Annual Freight Revenue Per Train Hour Per Mile Of Road Owned Per Annual Labor Expenses, 1940 - 1995. Standardized For 1980.¹⁷⁵

¹⁷⁴ Data calculated by dividing total freight revenue (Moody, 1996, p. a.12) by total revenue tons originated (Moody, 1996, p. a.12). Revenue is adjusted for 1995 Dollars (by GDP deflator).

¹⁷⁵ Revenue ton miles per train hour. See Footnote 172; miles of road owned: See Footnote 157; number of employees: See Footnote 170; annual freight revenue: See Footnote 165; annual labor expenses: See Footnote 170. Financial data are adjusted for 1995 Dollars (by GDP deflator).

Recall Figure 6 on page 42 which shows that the railroads increased their share of total intercity freight traffic since 1980. Also recall Figure 7 on page 45 which shows the rate of return of Class I railroads has increased significantly since deregulation.

D. Contract Rates

There are about 90,000 contracts in force in early 1990, affecting 60% of total rail traffic, 86% of coal tonnage, 63% of grain volume, and 54% of chemicals traffic.¹⁷⁶ In 1996, almost 70% of all rail traffic moved under contracts.¹⁷⁷ Railroad contract filing requirements were eliminated except for contracts for movement of agricultural commodities in 1997.¹⁷⁸

E. Deregulation of the Trucking Industry

The emergence of the trucking industry has been regarded as a major factor of the poor performance of the railroad industry, which ultimately led to railroad deregulation. In 1980, the year the railroad industry was deregulated, also the trucking industry was deregulated. In this section, the major aspects of

¹⁷⁶ Wilner, 1990.

¹⁷⁷ Railroad Facts, 1996, p. 6.

the deregulation of the trucking industry are highlighted. The section starts with an introduction of industry specific classifications.

1. Classifications of Trucking Firms

Statistical information in the trucking industry has some caveats due to complex classification systems of carriers that are often mixed up.

a. Standard Industry Classification

The motor freight transportation and warehousing industry groups are classified into nine industries. Among those the most important are **Local Trucking without Storage** (SIC 4212), **Local Trucking with Storage** (SIC 4214), **Trucking, except Local** (SIC 4213) (also denoted *intercity-*, *interstate-*, or *long-distance-carriers*).¹⁷⁹

b. Classification by Type of Contract

A **common carrier** is any carrier engaged in the *interstate* transportation of persons/property on a regular schedule at published rates, and whose

¹⁷⁸ Welty, 1997.

¹⁷⁹ Executive Office of the President Office of Management and Budget, 1987.

services are available to the general public on a for-hire basis.¹⁸⁰ A **contract carrier** is any carrier engaged in the *interstate* transportation of persons/property by motor vehicle on a for-hire basis, but under continuing contract with a limited number of customers to meet specific needs of each customer.¹⁸¹ A **private carrier** is any carrier that provides transportation service to the firm that owns or leases the vehicle and does not charge a fee.¹⁸²

c. *Classification by Commodity Carried*

The ICC had divided the *intercity trucking industry* (SIC 4213) into seventeen commodity divisions, including **general freight**¹⁸³ (50.0% of all carriers), tank truck (9.4%), bulk commodities (7.8%), refrigerated commodities (6.6%), household goods (6.0%), motor vehicles (1.7%), and other specialized commodities or other commodities not elsewhere classified (18.5%).¹⁸⁴

d. *Classification by Shipment Size*

Intercity carriers of general freight are further classified either into **LTL (less-than-truckload) carriers** or **TL (truckload) carriers**. TL carriers transport

¹⁸⁰ Muller, 1995, p. 255.

¹⁸¹ Muller, 1995, p. 256.

¹⁸² Muller, 1995, p. 267.

¹⁸³ nonbulk.

¹⁸⁴ American Trucking Associations, 1993.

shipments not less than a truckload (10,000 pounds) while LTL carriers transport shipments of less than a truckload.¹⁸⁵ In 1993, 40.2% of all ICC-regulated intercity carriers of general freight were TL carriers and 9.8% were LTL carriers.¹⁸⁶

e. Classification by Annual Gross Revenue

The ICC has classified motor carriers by their annual gross revenue into **Class I, Class II, and Class III** carriers.¹⁸⁷

2. The Motor Carrier Act of 1980

In the same year the Staggers Act deregulated the railroads also the trucking industry was deregulated through the Motor Carrier Act of 1980.

The main provisions of the Motor Carrier Act were:¹⁸⁸

- Entry into the trucking industry was encouraged by placing the “burden of proof” on existing carriers that additional service was not needed.
- Removal of operational restrictions former entrants had submitted to voluntary in order to overcome opposition on part of incumbents (like types of goods not carried, routes and interchanges not used, etc.).

¹⁸⁵ U.S. Census Bureau, 1995, p. B-3.

¹⁸⁶ American Trucking Associations, 1993.

¹⁸⁷ Muller, 1995, p. 254. In 1995, the Class I threshold was \$10 million, Class II threshold was \$3 - \$10 million, and Class III threshold was below \$3 million.

¹⁸⁸ Wood, 1990, p. 100.

- Removal of restrictions on the number of customers with whom each contract motor carrier can contract.
- A “zone of reasonableness” was introduced into motor common carrier rates. A carrier may charge rates within a range of plus minus 10 percent a year without regulatory approval.
- The influence of common carrier rate bureaus was reduced.
- Use of trucks by domestic airlines to pick up or deliver freight that is carried by air was facilitated.

Among these provisions freedom of entry was the most important factor.

Its effects were obvious immediately after deregulation of the motor carrier industry. In 1980, there were 18,000 motor carriers holding ICC licenses (intercity carriers), in 1986, there were 37,000¹⁸⁹, and in 1992 there were 49,000.¹⁹⁰ The total number of carriers is even higher. In 1997, the number of trucking establishments totaled 122,190.¹⁹¹

¹⁸⁹ Winston, 1990, p. 11.

¹⁹⁰ Teske, 1995, p. 71.

¹⁹¹ Dun & Bradstreet, 1997, p. 15. The number is the summation of 67,669 establishments in *Local Trucking without Storage* (SIC 4212), 8,177 establishments in *Local Trucking with Storage* (SIC 4214), and 46,314 establishments in *Trucking, except Local* (SIC 4213). In 1992, the numbers were as follows: *Local Trucking without Storage*: 49,870; *Trucking, except Local*: 40,821; *Local Trucking with Storage*: 4,512. Total was 95,203 (U.S. Census Bureau, 1996, Table No. 1024, p. 635). in 1977, the total number of establishments was 58,335 (U.S. Census Bureau, 1982, Table No. 1084, p. 624).

3. Economics of Size and Concentration in the Trucking Industry

The increase in entry into the trucking industry after deregulation suggests that there are no economics of size in the trucking industry. Classical barriers to entry appear to be absent: Capital requirements are low, and investment involves no sunk costs. Hence, the trucking industry appears to be potentially atomistic and approaching perfect competition. This is partly true for the truck-load (TL) sector. Both legal and economic barriers into the truck-load (TL) sector are relatively low. The large number of TL businesses operated as sole proprietorship supports this assumption.¹⁹² However, a large number of trucks and scheduled routes bring about an enhanced backhaul ability, and a large number of drivers stationed across the nation and sophisticated computer systems bring about shorter transit time. Therefore, there are potential economics of size in the TL sector, which however do not constitute barriers to entry. The less-than-truck-load (LTL) sector is quite different. To offer comprehensive nationwide LTL service, a network of at least 300 terminals is needed in order to provide competitive service.¹⁹³ LTL carriers collect, sort, consolidate, transport, and distribute shipments through a network of terminals organized on the hub- and-spoke principle. The LTL business process requires different equipment for each stage. Hence, in the LTL business there are distinct

¹⁹² Glaskowsky, 1986, p. 25.

¹⁹³ Glaskowsky, 1986, p. 5.

economics of size that prevent entry although legal barriers of entry had been removed by deregulation. Since deregulation, virtually no new carriers have entered the LTL freight industry and survived.¹⁹⁴

Figure 26 on page 99 depicts the concentration of the top two hundred motor carriers in 1995, split up into TL and LTL sectors. It can be seen that 6 LTL carriers account for 50% of the revenues of the top 55 LTL carriers and that 16 TL carriers account for 50% of the revenues of the 74 top TL carriers.

Although no data are available on each individual firm in the interstate trucking industry, the allover relation of number of establishments and total revenue indicates the dimension of concentration: There are about 120,000 firms¹⁹⁵ in the industry with total revenue of about \$90 billion.¹⁹⁶ The 129 firms graphed in Figure 26 on page 99 account for \$30 billion of revenue out of the industry total of \$90 billion. The large number of small firms suggests that barriers to entry into the are trucking industry (at least TL) are low. Nevertheless, the industry is dominated by large firms.

¹⁹⁴ Interstate Commerce Commission, 1992, pp. 36-40.

¹⁹⁵ See Footnote 191 on page 96.

¹⁹⁶ U.S. Census Bureau, 1996, p. 636, Table 1027. This number is not broken down into TL, LTL, and "others". See Footnote 197 on page 98.

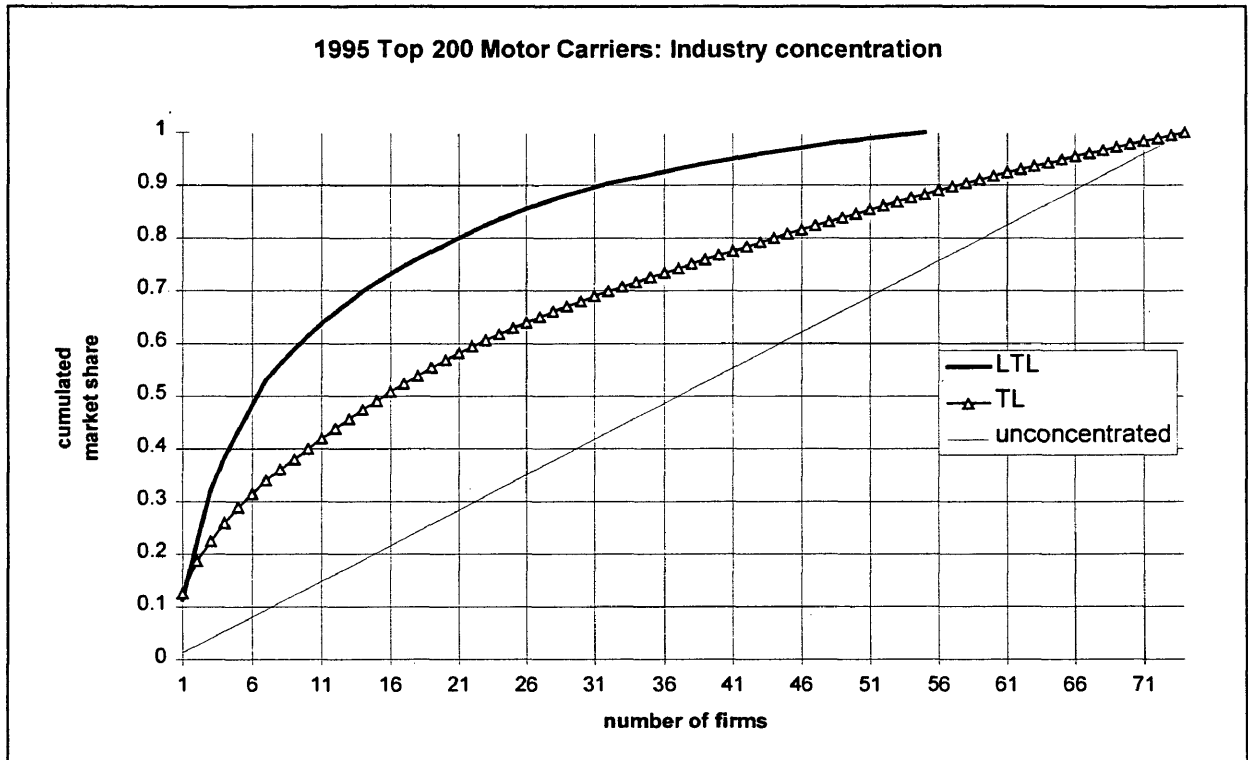


Figure 26: Top 200 Motor Carriers: Industry Concentration, 1995.¹⁹⁷

Figure 27 on page 100 depicts the HHIs of the TL and LTL carriers graphed in Figure 26 on page 99. Although below the critical level of 1,000, the HHI for the LTL sector is more than 10 times higher than the HHI for the TL sector. Roberts argued that separating carriers by the markets in which they

¹⁹⁷ Data from American Trucking Associations, 1995. The data is based on 1995 revenues. The various categories these carriers were classified into by type of goods carried were consolidated into three classes: LTL, package/courier/expedited, and household goods were consolidated into LTL, TL and bulk/tank trailers were consolidated into TL, and all other were consolidated into

compete reveals even higher concentration. For example, transcontinental carriers were defined as carriers with average hauls over 1,000 miles, there were only six transcontinental LTL carriers giving the market a HHI of 2357.¹⁹⁸

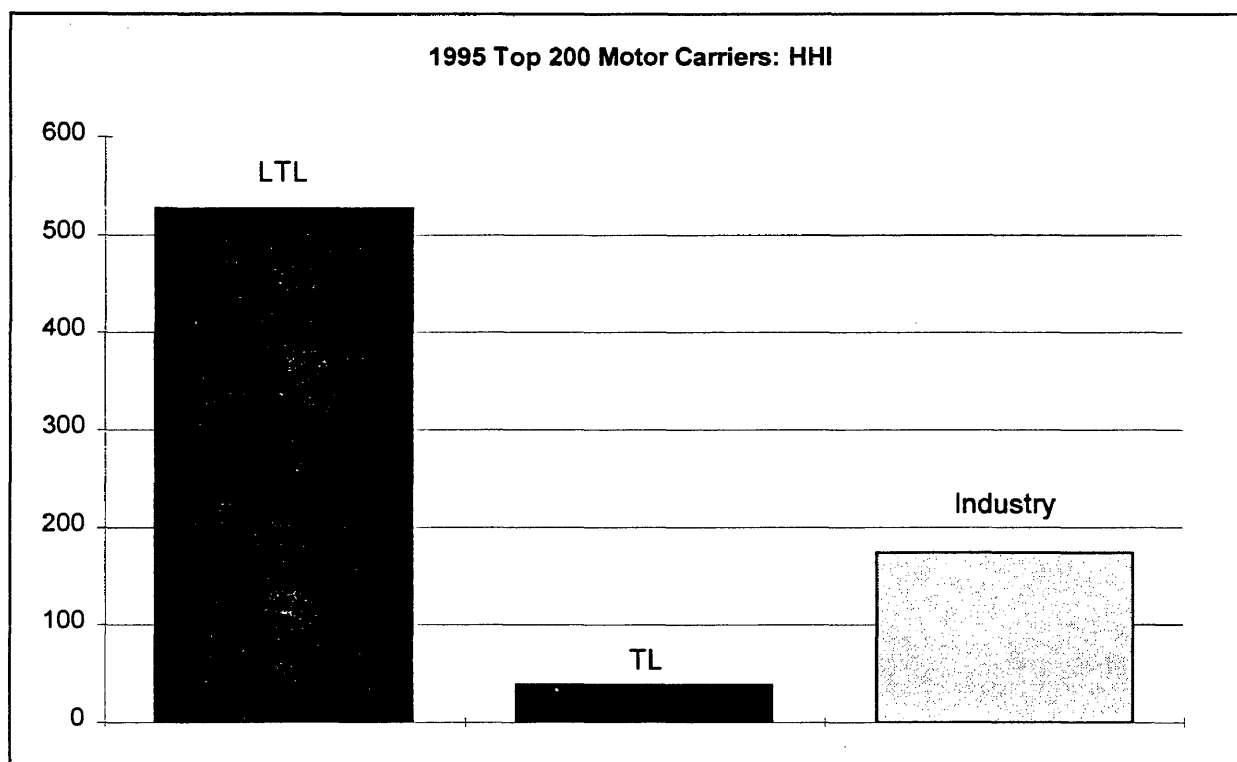


Figure 27: Top 200 Motor Carriers: HHI, 1995.¹⁹⁹ LTL = less-than-truck-load; TL = truck-load.

others which has been excluded. UPS which is number one and accounts for 26.6% of revenues of the top 200 motor carriers has been excluded.

¹⁹⁸ Roberts, 1992.

¹⁹⁹ See Footnote 197 on page 96.

In this chapter, the main developments in the railroad industry that have occurred after deregulation were examined. These are continuing firm concentration and streamlining of operations. Also the trucking industry and its development after deregulation were introduced. In chapter V, intermodal transportation, a form of transportation that has become most significant after deregulation, is introduced. Secondly, the railroad market is segmented and particular segments are analyzed for contestability.

CHAPTER V.

THE U.S. RAILROAD INDUSTRY IN THE 1990s

A. Intermodal Transportation

1. The Economics of Intermodal Transportation

Intermodal freight transport is a logistically linked movement of freight using two or more modes of transport. The idea of intermodality is to capitalize on mode specific advantages that are mutually exclusive in single mode transportation, mostly *universal service availability versus low costs per ton-mile*. Potential gains from intermodality are twofold. First, intermodality can provide shippers who are not immediately served by a low-cost carrier with access to a low-cost carrier via an intermediate high-cost carrier.²⁰⁰ Second, the low-cost carrier, usually specialized in uninterrupted long-haul, is able to reduce the number of stops since freight is consolidated by high-cost carriers. That is, take advantage of the average length of haul, which is a key determinant of profitability for railroads (see Figure 20 on page 84).

²⁰⁰ Although low cost carrier service might be available at the location of a shipper, the shipper might not meet the minimum volume requirements. Therefore, shipments need to be consolidated by a high cost carrier.

Depending on the type of freight carried specific combinations of modes are favorable in practice. Table VI on page 103 depicts three different combinations. A railroad is a low cost carrier compared to a truck, but a high-cost carrier in comparison to a barge. The combination truck-railroad for container traffic is the most common combination followed by barge-railroad for non-liquid bulk material. Intermodal railroad-truck service, combines the door-to-door service of trucks with the high-volume, long-haul economies of railroads. In intermodal railroad-truck service the primary types of equipment involved are containers or truck trailers which are carried on railroad cars. The combination truck-railroad-ocean vessel is most common in overseas container traffic.

Commodity	Economical Modes of Transport
Containerized commodities	Truck, Railroad, Barge
Solid bulk material/grain	Railroad, Barge
Liquid bulk material	Pipeline, Barge, Railroad

Table VI: Economical Intermodal Combinations Of Carriers, Modes Ranked By Carrier Cost Per Ton-Mile.

Intermodal transport is organized in accordance with a hub-and spoke system. Figure 29 on page 104 presents a generic hub-and-spoke topology to be carried from A_1 to A_2 . A commodity is first carried the distance AB_1 from A_1

into hub 1 on a high-cost mode and then transshipped onto the low-cost carrier. The low-cost carrier moves the commodity over the distance CE from hub 1 into hub 2, where the commodity is again transshipped to another high-cost carrier that moves it the distance BA₂ into A₂.

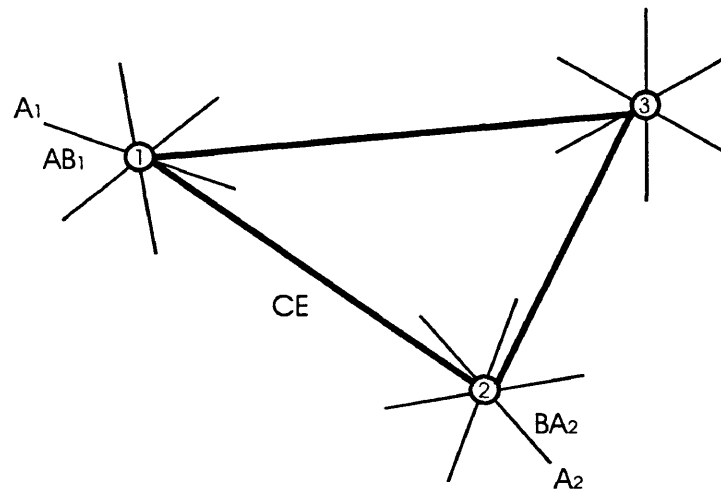


Figure 29: Generic Hub-And-Spoke Topology.

Figure 30 on page 105 shows the corresponding cost structure, which is the basic cost structure inherent in any hub-and-spoke system. AF represents the total cost curve of the *high*-cost carrier (spoke), indicated by a steeper slope of the cost curve, while CE represents the total cost curve of the *low*-cost carrier (inter-hub connection) which is not directly available for the shipper. The difference $P_C - p_B$ represents the cost of transshipment (hub) which equal the

costs associated with unloading the high-cost carrier and loading the low-cost carrier. In the context of Figure 30 on page 105, indicated by the dark line ABCDE, a good is carried the distance d_B at cost p_B , transshipped at cost $p_C - p_B$, and then carried on the low-cost carrier at cost $p_E - p_C$. For simplicity, it is assumed that the distance d_B includes pickup and drayage ($d_B = AB_1 + BA_2$ in Figure 29 on page 104) and that $p_C - p_B$ represent the cost of transshipment at both interchanges. Point D represents the break-even point, and correspondingly d_D is the break-even distance beyond which intermodal traffic becomes less costly. In practice, the break-even distance between railroad service and truck service is about 500-700 miles.²⁰¹

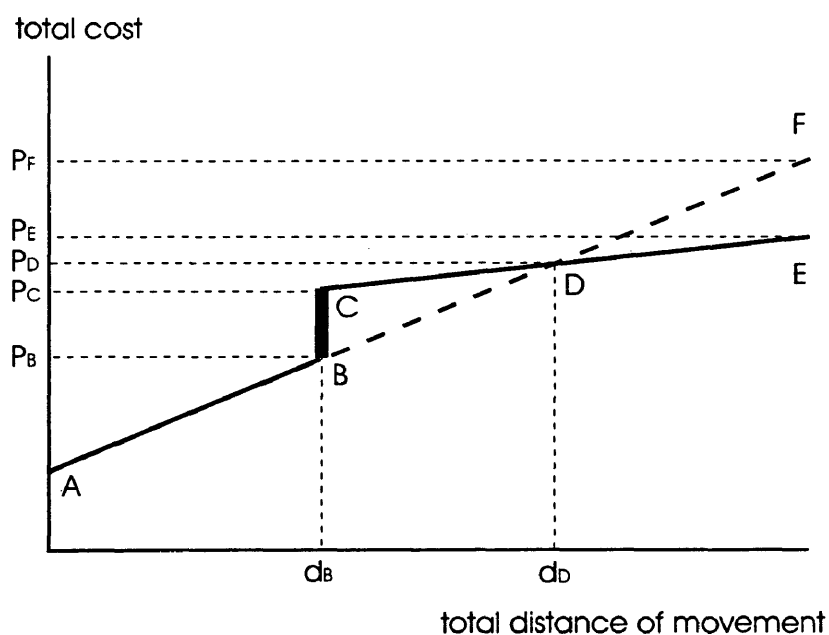


Figure 30: Cost Structure Of Intermodal Transportation.

²⁰¹ United States General Accounting Office (GAO), 1993, p. 23.

In the economic analysis of hub-and-spoke systems the transshipment *facility* (hub) and the transshipment *process* are the key objects. Taking the cost structure of the high-cost and the low-cost carriers involved as given, Figure 30 on page 105 suggests that total costs of the entire movement are solely dependent on transshipment costs.²⁰² Hence, the objective is to minimize transshipment costs.

There are two different approaches to minimize transshipment costs. First, it has been empirically confirmed that hub facilities demonstrate size economies.²⁰³ That is, the larger the hubs are and the lower the number of hubs is the more costs are saved. Second, it has been found that transaction costs associated with multiple independent ownership of carriers and hubs are much higher than the costs of administrative command under uniform ownership.²⁰⁴ Hence, overall costs are minimized by integrating hub facilities and all carriers involved in the transportation chain under uniform administrative command and ownership.²⁰⁵

²⁰² This assumption is not completely accurate because average total costs of haul may be a function of length of haul. For purpose of this examination, differences are assumed to be inferior over the relevant range of output.

²⁰³ Allen, 1986, pp. 22-23.

²⁰⁴ Allen, 1986, pp. 26-27.

²⁰⁵ For a broad discussion of the transaction cost approach, see Coase, 1991, p.18.

To conclude, as far as railroads are involved, costs of intermodal transportation are minimized if:

1. *The distance between terminals is rather long.*

Freight revenue is based on ton-miles per time. That is, the longer the haul, the heavier loaded the train (the more cars), and the shorter any delays are, the more revenue the railroad earns.²⁰⁶ A terminal constitutes a stop which causes a delay. Moreover, the more terminals there are, the shorter the average length of haul and the less average train load between terminals.

2. *Terminals are large in size.*

Terminal operation demonstrates size economics. Therefore, it is more profitable to operate a few large terminals rather than many small terminals. This also supports the demand for long hauls in between terminals, and heavier loaded trains.

3. *Terminals and other modes of transportation involved are operated under uniform administrative command and ownership.*

²⁰⁶ This has been found earlier (see section Operations on page 76).

It has been found that an intermodal entity under uniform ownership can provide all services in the transportation chain at lower costs than under multiple ownership. That is, an entity under uniform ownership providing all different intermodal services has a strictly subadditive cost function and hence constitutes a natural monopoly (multiproduct case).²⁰⁷ Consequently, intermodal transportation is always a natural monopoly. Since railroads are generally the financially strongest firms involved in intermodal transportation, it is likely that intermodal entities are put under administrative command and ownership of railroads. A survey among chief executives of all Class I railroads in 1981 revealed that more than three-fourths of the survey respondents indicated that their railroads planned to attempt to expand on an intermodal ownership basis during the next five years.²⁰⁸ Trucking was most often identified as the likely direction of such expansion. The most important benefits offered by further integration of the modes are a broader traffic base and improved service through provision of one-stop, door-to-door intermodal service.

2. Intermodal Acquisitions

²⁰⁷ See The Natural Monopoly on page 13.

²⁰⁸ Lieb, 1982, p. 74.

In 1983, the ICC removed the ban on acquisition of commercial trucking firms by railroads.²⁰⁹ During the following years several intermodal acquisitions took place: In June, 1985, Norfolk Southern Corporation acquired North American Van Lines and its subsidiaries.²¹⁰ Today, North American Van Lines is the twelfth largest motor carrier in the U.S.²¹¹ In October, 1996, Union Pacific Corporation acquired the Overnite Transportation Company.²¹² Today, Overnite Transportation Company is the tenth largest motor carrier (LTL) in the U.S.²¹³

In 1983, CSX Corporation acquired American Commercial Barge Lines, the nation's largest barge line with between 6% and 7% of the inland waterway transportation market. It was the first time a railroad had been allowed to purchase a barge line since the Panama Canal Act of 1912 forbade railroads from owning water carriers.²¹⁴ In September 1986, CSX Corporation acquired Sea-Land Service, Inc., one of the nation's largest ocean carriers.²¹⁵ In 1987, CSX integrated Sea-Land Service's trucking subsidiaries into its new intermodal unit, CSX Intermodal, Inc.²¹⁶ In 1988, CSX acquired a majority interest in Yukon Pacific Corp., an Alaska based corporation that is promoting the construction of a

²⁰⁹ New York Times, 01/07/83.

²¹⁰ Moody, 1996, p. 76.

²¹¹ American Trucking Associations, p. 2.

²¹² Moody, 1996, p. 110.

²¹³ American Trucking Associations, 1995, p. 1.

²¹⁴ Industry Week, 08/06/84.

²¹⁵ Moody, 1996, p. 421.

²¹⁶ Abruzzese, 1987.

Trans-Alaska-Gas System to export North Slope natural gas to Pacific Rim countries.²¹⁷

In 1987, the Court of Appeals, District of Columbia Circuit, rescinded the ICC's 1983 rule which eased acquisition of trucking firms by railroads. This litigation sprang from Burlington Northern's attempt to acquire six trucking companies at the same time.²¹⁸ In 1994, Atchison, Topeka and Santa Fe Railway (now merged into Burlington Northern Santa Fe Corporation) reached an agreement for joint intermodal operations with Yellow Freight System, Inc. (a LTL carrier), the nation's second largest motor carrier after UPS (see Footnote 197 on page 98).²¹⁹ Table VII on page 111 depicts today's intermodal subsidiaries of Class I railroads.

Although the ease of national intermodal acquisitions has been stemmed, it continues internationally. In June 1996, CSX, NS Cargo (the Netherlands' rail freight operator), and Germany's Deutsche Bahn (DB) announced that they have signed a letter of intent to jointly create a company called NDX Intermodal. The new company will provide freight service for the movement of containers, trailers and swap body freight throughout Europe.²²⁰

²¹⁷ Moody, 1996, p. 421.

²¹⁸ Regular Common Carrier Conference v. U.S., 820 F.2d 1323 (D.C. Cir. 1987)

²¹⁹ Klaus, 1994.

²²⁰ Hill, 1996.

Railroad	Intermodal Subsidiary	SIC Class	SIC
Conrail	Merchants Dispatch Transp. Co.	Fixed Facilities and Inspection and Weighing Services for Motor Vehicle	4785
Norfolk Southern	Lambert's Point Barge Company, Inc.	Water Transportation of Freight, nec	4449
	Lambert's Point Docks, Inc.	Marine Cargo Handling	4491
	Airforce Pipeline Inc.	Refined Petroleum Pipelines	4613
	NS Transportation Brokerage Corporation	Arrangement of Transportation of Freight and Cargo	4731
	Southern Region Motor Transport, Inc.	Trucking, Except Local	4213
	North American Van Lines, Inc.	Trucking, Except Local	4213
CSX	American Commercial Lines Inc.	Water Transportation of Freight, nec	4449
		Ship Building and Repairing	3731
	CSX Intermodal, Inc.	Railroads, Line-Haul Operating	4011
		Deep Sea Foreign Transportation of Freight	4412
		Water Transportation of Freight, nec	4449
	Sea-Land Service, Inc.	Deep Sea Foreign Transportation of Freight	4412
	Yukon Pacific Corp.	(Pipeline)	
Kansas City Southern	Landa Motor Lines	Trucking, Except Local	4213
UP	PMT of the Southwest, Inc.	Trucking, Except Local	4213
	Southern Illinois and Missouri Bridge Co.	Transportation Services, nec	4789
	The Ogden Union Railway and Depot Co.	Transportation Services, nec	4789
	Overnite Transportation Co.	Trucking, Except Local	4213
		General Warehousing and Storage	4225
	Pacific Motor Transport Co.	Trucking, Except Local	4213
	Pacific Motor Trucking Co.	Trucking, Except Local	4213
	Southern Pacific Warehouse Co.	General Warehousing and Storage	4225

Table VII: Class I Railroads: Intermodal Subsidiaries, 1997.²²¹²²¹ National Register Publishing Company, 1997.

3. The Intermodal Business (Rail-Truck)

Today's intermodal service has arisen during the last 20 years. Between 1980 and 1995, the number of intermodal units loaded by United States railroads increased from 3.0 million units to 8.1 million units, or more than 250% (see Figure 31 on page 113).²²² Accordingly, intermodal service has become a very important source of revenue for railroads. In 1994, intermodal traffic generated approximately 15 percent of total revenues of railroads, making it the second most important revenue source.²²³ Generally, only high value commodities (non-bulk) are shipped in intermodal units. This is remarkable insofar as high value goods traditionally are not shipped by railroad because railroad transportation traditionally was seen to be less reliable and damage rates were high.

²²² Intermodal units are *trailers*, also denoted TOFC (trailer-on-flatcar) or "piggyback", and *containers*, also denoted C.O.F.C. (container-on-flatcar, known as "double-stack train").

²²³ Muller, 1995, p. 29.

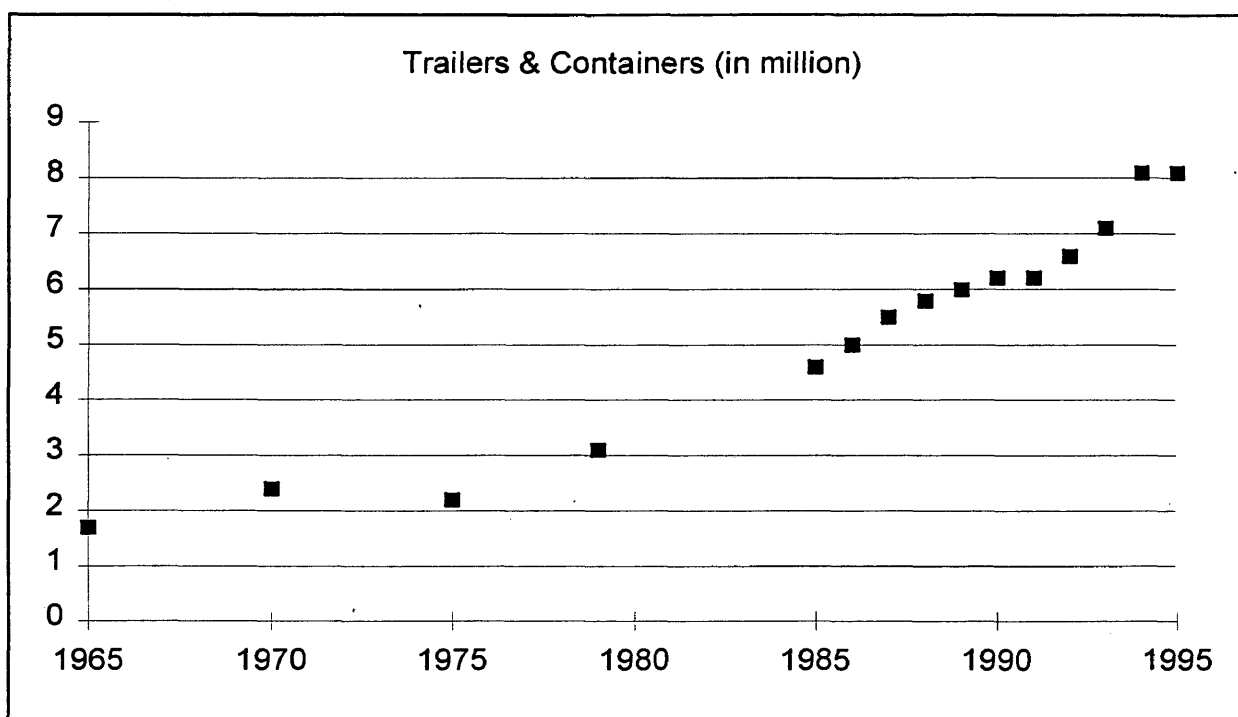


Figure 31: Class I Railroads: Intermodal Traffic, 1965 - 1995.²²⁴

Despite the rapid growth since 1980, intermodal traffic still accounts for only a small share of the total intercity freight traffic in the U.S., about 6 percent.²²⁵ It is estimated that 25% of the intercity trucking market is susceptible to competition between intermodal rail service and truckload companies, which is the share of interstate trucking freight hauled over more than 500 miles.²²⁶

²²⁴ Railroad Facts, 1996, p. 26.

²²⁵ Railroad Facts, 1996, p. 26.

²²⁶ United States General Accounting Office (GAO), 1993, p. 24.

Generally, railroads act as wholesalers in selling intermodal service, while third parties act as retailers and consolidators of small shipments.²²⁷ Rail contracts now offer rate structures that induce container traffic consolidation into larger trains, denser routes, fewer origin and destination points, and fewer ports.²²⁸

In 1984, container and trailer traffic was exempted from regulation. The Shipping Act of 1984 introduced greater flexibility in the use of service contracts for the ocean shipping and intermodal movement of containers. In 1991, Congress passed the Intermodal Surface Transportation Efficiency Act which aims at developing a nationwide intermodal transportation system. It encourages intermodal connectivity (i.e., agreements among carriers of different modes), providing legislative and financial incentives of \$155 billion in the fiscal years 1992-1997.²²⁹

Although the intermodal business has been growing, the number of terminals has been declining. In 1975 there were 1,500 intermodal terminals in the U.S., compared to 230 in 1990.²³⁰ The reduction in the number of terminals can be explained in two ways. First, it is a direct consequence of the

²²⁷ Those are *Shippers' Agents* now denoted *Intermodal Marketing Companies (IMC)*, *Shippers' Associations*, and *Freight Forwarders*.

²²⁸ MacDonald, 1996.

²²⁹ Muller, 1995, p. 27.

concentration of Class I railroads which made “doubled facilities” obsolete. Second, the cost structure of railroad operation calls for concentration of terminals per se. Computerized logistics via EDI have become a core component of intermodal service, calling for further centralization and concentration.

B. Is the Railroad Monopoly Contestable?

In the 19th century, the railroads had been the only means of transportation. In 1887, a rationale for railroad regulation had been to protect shippers from abuse of monopoly power of the railroads. In 1980, a rationale for deregulating the railroads was that the impact of railroads on the surface transportation system of the U.S. had been dwindling and hence there was no threat of abuse of monopoly power on part of the railroads any more. The railroad industry was not said to be *competitive*, but since there were alternatives to railroad service in most cases, railroad service was seen to be *contestable*.²³¹

Since the deregulation in 1980, the railroad industry has undergone some significant structural changes. In particular, the railroads have improved their efficiency by 350%, the concentration of Class I railroads has taken on levels far

²³⁰ United States General Accounting Office (GAO), 1993, p. 22.

above the “critical level”, and railroads have acquired leading firms of different modes of transportation. Therefore, in this section of the study, it is examined whether the railroad industry can said to be contestable today.

1. Defining The Relevant Market

The degree of market power, competition, and contestability can only be measured for a relevant market. That is, the entire market needs to be segmented by (1) product and by (2) geographic area for further examinations.

a. *Product*

In the railroad industry “product” means movement of a particular commodity. Figure 19 on page 83 depicts all major types of commodities carried by railroads. For the following examinations those are consolidated into four major groups (see Table VIII on page 118). Those are “intermodal” (index “I”), “liquid bulk material” (index “L”), “solid bulk material” (index “S”), and “farm products” (index “F”), where each of them constitutes a separate product market. Each product market p is assigned a “degree of potential contestability” C_p based on consideration by which modes each commodity group can be shipped *economically*. “Economical” in this context means that the rate for transportation

²³¹ See The Staggers Rail Act of 1980 on page 48.

of a unit of a particular commodity by a certain mode does *not* exceed a prohibitive threshold which would disallow transportation of that particular commodity by that mode in practice. However, even though there may be several *economical* modes of transportation for each particular commodity, there may be considerable rate differentials among these modes. The more competitive in their primary markets the modes of transportation being economical for a particular commodity are, and the more alternative modes of transportation are economical for a particular commodity, the more potentially contestable that particular product market is.

Product Market p	Assessment
Containerized goods (intermodal) (C _i = 4)	Containers can be economically shipped by barge, railroad, and truck (TL) . Although trucking is the least economical mode of transportation, trucking is most economical for containerized goods (high-value goods). The TL industry is competitive because entry is free (i.e., it is most likely that every shipper has the opportunity to ship containers by truck alternatively to railroad or barge) and trucks are not locally bound. ²³²
Liquid bulk material ("oil") C _L = 3	Liquid bulk materials can be economically shipped by pipeline, barge, and railroad . There are two alternatives if one mode drops out. However, all three alternatives are locally bound and hence possibly not actually available at any particular location.
Solid bulk material C _S = 2	Solid bulk materials can be economically shipped by barge, and railroad . There is only one alternative if one mode drops out. However, both alternatives are locally bound and hence possibly not actually available at any particular location.
Farm products ("grain") C _F = 1	Farm products can be economically shipped by barge, and railroad . There is only one alternative if one mode drops out. However, both alternatives are locally bound and hence possibly not actually available at any particular location. Further, shipper's bargaining power is rather low (there is a large number of small shippers) and the business is seasonal which may cause reluctance on part of carriers to make commitments in equipment and other capacity.

Table VIII: Commodities (Product Markets) Ranked By And Their Degree Of Potential Contestability C_p.²³³

²³² See Economics of Size and Concentration in the Trucking Industry on page 97.

²³³ "4" = most contestable. See also Table VI on page 103.

For formal purposes, the entries in Table VIII on page 118 can be rewritten as matrix $\underline{\underline{E}}$ (matrix of economical modes of transportation in particular product markets), where an entry $E_{pm} = 1$ indicates that mode m is an economical mode of transportation in product market p and $E_{pm} = 0$ indicates that mode m is not an economical mode of transportation in product market p . Modes of transportation are indexed R = "railroad", M = "motor carrier", B = "barge", P = "pipeline".

$$\underline{\underline{E}} = \begin{bmatrix} E_{IR} & \cdots & E_{IP} \\ \vdots & \ddots & \vdots \\ E_{FR} & \cdots & E_{FP} \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}.$$

Vector $\underline{\underline{C}}$ contains the degree of potential contestability C_p of each product market p ,

$$\underline{\underline{C}} = \begin{bmatrix} C_I \\ C_L \\ C_S \\ C_F \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \\ 2 \\ 1 \end{bmatrix}.$$

b. Geographic Area

Table IX on page 120 shows the relative density of transportation modes in selected regions R_g of the United States.

Region \ Mode	Railroad	Highway	Waterway	Pipeline
(1) East of Missouri River	2	3	1	2
(2) West of Missouri River	1	1	0	1
(3) Official Territory	3	4	3	3
(4) Gulf Coast	3	2	2	4
(5) Ohio River region	4	4	3	4

Table IX: United States: Relative density of transportation modes A_{gm} .²³⁴

Table IX on page 120 accounts for the relative (with respect to other geographic regions) density of transportation modes and hence for the general availability of modes of transportation in particular regions. It does not account for ownership diversity. That is, although a particular region may exhibit a high density of a particular mode, competition in that mode does not need to be high accordingly.

²³⁴ "4" = dense; "3" = medium; "2" = sparse; "1" = fairly sparse, "0" = none. *Railroad*: See Table IV on page 72; *Highway*: Wood, 1990, p. 95; *Waterway*: Wood, 1990, p. 182; *Oil Pipeline*: Wood, 1990, p. 151.

For formal purposes, the entries information in Table IX on page 120 can be rewritten as matrix $\underline{\underline{A}}$ (matrix of availability of modes of transportation m in geographic markets g), where an entry A_{gm} indicates to what relative extend mode m is available in a geographic market g

$$\underline{\underline{A}} = \begin{bmatrix} A_{1R} & \cdots & A_{1P} \\ \vdots & \ddots & \vdots \\ A_{5R} & \cdots & A_{5P} \end{bmatrix} = \begin{bmatrix} 2 & 3 & 1 & 2 \\ 1 & 1 & 0 & 1 \\ 3 & 4 & 3 & 3 \\ 3 & 2 & 2 & 4 \\ 4 & 4 & 3 & 4 \end{bmatrix}.$$

2. The Relevant Markets

To determine the degree of potential contestability of each product market in each geographic region, the cumulated availability of all modes for each commodity group in each geographic region is determined and then multiplied by the degree of potential contestability of each product market.

Matrix $\underline{\underline{C}}$ contains the degree of potential contestability of each product market in each geographic region.

$$\underline{\underline{C}} = \begin{bmatrix} C_I \times \sum_m (E_{Im} \times A_{1m}) & \cdots & C_F \times \sum_m (E_{Fm} \times A_{1m}) \\ \vdots & \ddots & \vdots \\ C_I \times \sum_m (E_{Im} \times A_{5m}) & \cdots & C_F \times \sum_m (E_{Fm} \times A_{5m}) \end{bmatrix},$$

$$\text{which yields } \underline{\underline{C}} = \begin{bmatrix} 24 & 15 & 6 & 3 \\ 8 & 6 & 2 & 1 \\ 40 & 21 & 12 & 6 \\ 28 & 21 & 10 & 5 \\ 44 & 33 & 14 & 7 \end{bmatrix}.$$

The entries of matrix $\underline{\underline{C}}$ are reproduced in Table X on page 123. The numbers given in Table X on page 123 are not cardinal, do not reflect cost differentials among modes, and do not reflect ownership diversity. Nevertheless, Table X on page 123 indicates to what (relative) extent different physical means for economical transportation for particular commodity groups (product markets) are available in particular regions of the U.S. (geographic markets), which is proportional to the degree of potential contestability of certain (product and geographic) transportation markets. Accordingly, intermodal transportation in the Ohio River region appears to be most potentially contestable, while shipping farm products West of the Missouri River seems to be least contestable.

Region \ Commodity	Intermodal	Liquid bulk material	Solid bulk material	Farm products
East of Missouri River	24	15	6	3
West of Missouri River	8	6	2	1
Official Territory	40	21	12	6
Gulf Coast	28	21	10	5
Ohio River region	44	33	14	7

Table X: Degree Of Potential Contestability In Particular Transportation Markets.²³⁵ The extremum values are bolded.

However, Table X on page 123 does not account for shipments in between markets. This fact is of particular importance insofar as the break even distance beyond which railroad service becomes an economical alternative in intermodal transportation is at 500 miles or more.²³⁶ That is, to really capitalize on the potentially contestable environment in the Ohio River region, commodities must be shipped over at least 500 miles. A circle with a radius of 500 miles

²³⁵ The numbers in Table VIII and Table IX are ordinal, so they do not bear any weight with respect to each other and hence cannot be a base for the cardinal numbers in Table X. *Adding up* relative mode availability of particular transportation modes economical for transportation of particular commodity groups implies a linear relation which may not reflect reality. The multiplicative correlation of the cumulated mode availability of particular transportation modes economical for transportation of particular commodity groups and the degree of potential contestability of particular product markets may also not reflect reality. However, since the only purpose of Table X is to identify minimum and maximum, the calculation method applied is sufficiently accurate.

²³⁶ The break even distance for truck-barge and rail-barge is even longer considering the fact that barge transportation is a low cost mode compared to railroad transportation.

around the Ohio River region intersects Minneapolis, Kansas City, Arkansas, Alabama, and the North Atlantic Coast.

Table XI on page 124 indicates that barge service alternative to railroad service exists only to three of the five destinations, namely the North Atlantic Coast, the Gulf Coast, and to Minneapolis/St. Paul. However, the upper Mississippi River System is closed to barge traffic during the winter months. Thus, Minneapolis/St. Paul does not have barge service over one-third of the year.²³⁷

Destination	Available Modes for Direct Transport (other than truck)
North Atlantic Coast	3 Railroads (Conrail, CSX, NFS), Barge
Gulf Coast	1 Railroad (IC), Barge
Minneapolis/St. Paul	1 Railroad (Soo), Barge
Southeast	2 Railroads (CSX, NFS)
West of Missouri River	2 Railroads (via interchange)

Table XI: Available Modes For Freight Transport (Other Than Truck) Out Of The Ohio River Region Into Destinations More Than 500 Miles Away.

²³⁷ Kocemba, 1995.

The North Atlantic Coast and the Ohio River region are linked through three Class I railroads, an inland waterway, and a dense interstate highway network. Hence, intermodal transportation between these two regions appears to be most contestable.

As shown in Table X on page 123, transportation of farm products out of the Region West of the Missouri River appears to be least contestable. The most remote region west of the Missouri River that is exporting farm products at large scale, is the State of North Dakota. Therefore, for the following examinations, the study will concentrate on North Dakota as potentially least contestable region of the U.S. If this market, which is least likely to be contestable, is still sufficiently contestable, then deregulation is clearly justified in all markets.

3. The Local Market

The central statement of the contestable market theory is that the threat of potential entry makes a monopolist behave like a firm under perfect competition, hence, to set its price equal to average total cost. Otherwise, a potential competitor would enter the market and serve the incumbent's demand. If the incumbent matches the price, the entrant would withdraw by fully recovering his outlays.

Figure 32 on page 127 illustrates a typical local scenario. Terminal A of Railroad A (charging rate r_A for the movement of a container over a distance x) is located in the immediate environs of shipper S' location. In the broader environs there are Terminal B of Barge Line B and Terminal C of a competing Railroad C (charging rate r_C for the movement of a container over the same distance x). ATC_A are assumed to equal ATC_C while $r_A > r_C$. Trucking service is available everywhere where $C_T\{y\}$ is the uniform linear rate charged by the trucking service for moving a container over the distance y .

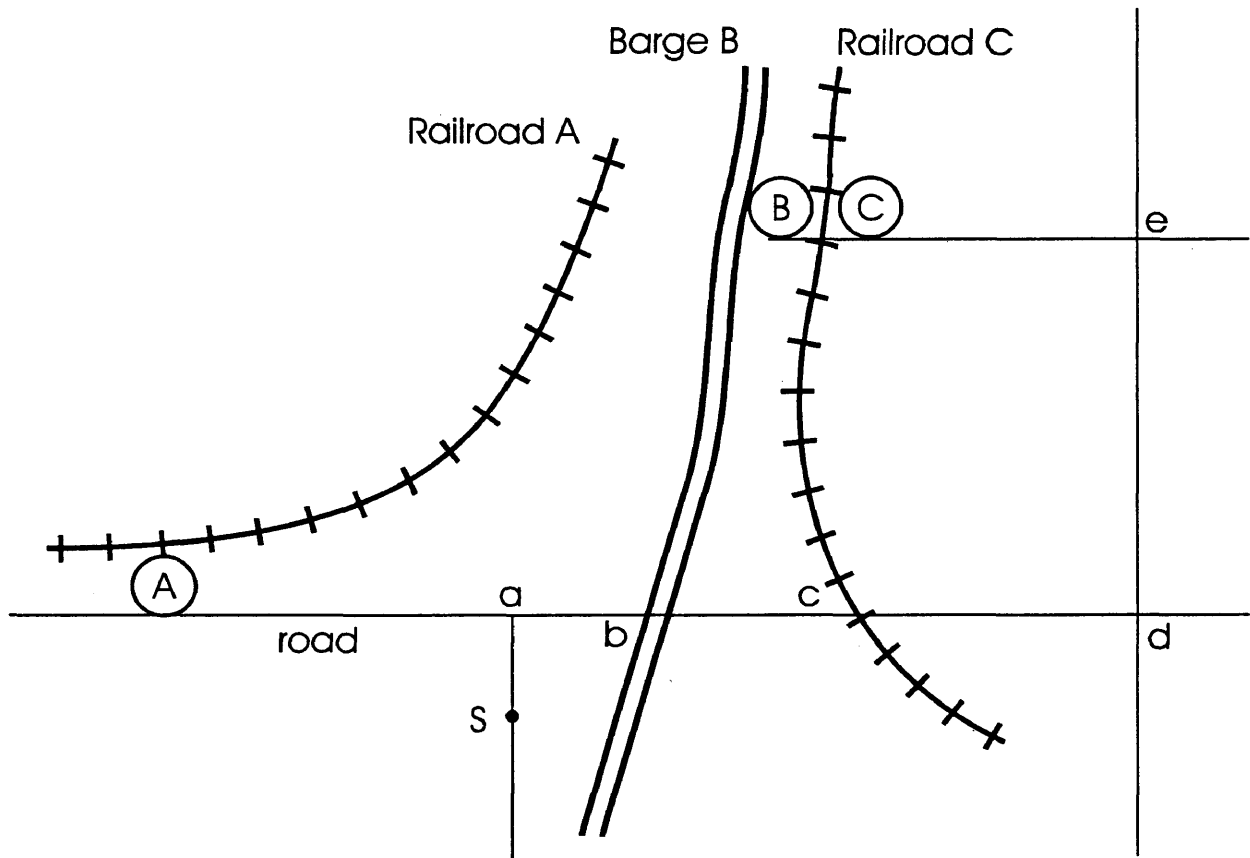


Figure 32: Contestability At The Local Level.

To ship a container on Railroad A (or to receive the container from A), the container must be trucked over the distance SaA at costs $C_T\{SaA\}$. To ship the same container on Railroad C (or to receive the container from C), the container must be trucked over the distance $SadeC$ at costs $C_T\{SadeC\}$, where $C_T\{SadeC\} > C_T\{SaA\}$. As long as $[r_A + C_T\{SaA\}] < [r_C + C_T\{SadeC\}]$, it is still more profitable for S to ship on Railroad A although $r_A > r_C$. Although Railroad A is making excess profit ($[r_A - ATC_A] > [r_C - ATC_C]$), Railroad C would not move its Terminal C closer to S because this would involve transaction costs and Railroad

C would also forgo revenues from other shippers incurring higher trucking costs after the shift. Just as much, Railroad C would not erect a second terminal close to S because of operating costs involved that would exceed marginal profits from S. Principally, railroads are even inclined to reduce the number of terminals.²³⁸ Railroad C might lower its rate r_C to attract S, but then Railroad A would respond with a rate cut and both railroads would end up sacrificing profits (predatory pricing).

The same principle applies for shipments on Barge Line B. Also, as depicted in Figure 32 on page 127, Barge Line B cannot interchange containers with Railroad A at all, and vice versa. By locating terminals distant from waterways, railroads avoid to interchange traffic with barge lines. This enables the railroad to provide the entire haul on its own, which generates more ton-miles at constant loading/unloading costs. Railroads have been accused pursuing this strategy.²³⁹

If the local market depicted in Figure 32 on page 127 was perfectly contestable, then Railroad C or any other entrepreneur would immediately erect a terminal at point c (as Barge Line B would do at point b), set r_C slightly below r_A , serve S, and earn excess profit of $r_C - ATC_C$. Railroad A would not

²³⁸ See The Intermodal Business (Rail-Truck) on page 112.

immediately react by matching or undercutting r_C (Bertrand-Nash-Conjecture).

However, it has been shown that all this is not going to happen. Consequently, a market with properties like that depicted in Figure 32 on page 127 is not perfectly contestable.

On the other hand, the market is not purely monopolistic. Since a container can be physically shipped on a truck, the availability of trucking service keeps the railroad rate difference $\Delta r_{AC} = (r_A - r_C)$ within certain boundaries ($\Delta r \leq C_T \{SadeC\} - C_T \{SaA\}$). Hence, trucking service is to some extent a substitute for rail service because its availability influences rail rates. However, it is not a *perfect* substitute because the cost of shipping a container by truck exceeds cost of shipping a container by rail and therefore allow for the rail rate difference Δr_{AC} to be *sustainable*. Hence, the *rate differential of two modes* $\delta r_{HL} = (r_H - r_L)$ is a measure of their *economical substitutability* which is proportional to the *contestability* of their common market, provided physical substitutability is feasible. The degree of contestability can be expressed by the coefficient²⁴⁰

$$C = 1 - \frac{r_H - r_L}{r_H} = \frac{r_L}{r_H} \quad (1)$$

²³⁹ Muller, 1995, p. 35.

where r_H is the rate of the high-cost carrier (short-haul) which is competitive in its primary market and r_L is the rate of the low-cost (long-haul) carrier exhibiting monopolistic behavior. Perfect contestability would be achieved where $C = 1$ while $C = 0$ would constitute a case of a pure monopoly. In contrast, the sustainable rate difference among monopolistic carriers Δr_{AC} is solely a function of a difference in the costs of the short-hauls, which is a function of in the distances shipper-terminal at a given high-cost carrier rate $C_T\{y\}$. In the context of Figure 32 on page 127, sustainable rate difference among monopolistic carriers is²⁴¹

²⁴⁰ Substitutability of products, which is proportional to contestability in this case, can also be measured by their *cross-price-elasticity*.

²⁴¹ The preceding assumption is somewhat simplistic since the shipper assumes both long-haul rates, r_A and r_C , to be based on the same long-haul distance x , which is realistic when approached from the non-contestable edge because in the non-contestable case the *long-haul rate per ton-mile* is per definition lower than the *short-haul rate per ton-mile* (Equation 1). That is, differences in the long-haul length among both long-haul carriers cause only negligible differences in the total long-haul charge. Starting the train of thought from the edge of perfect contestability ($C = 1 \rightarrow r\{x\} = C_T\{y\}$) requires to be more specific: Assume the shortest distance between shipper and final destination (as he crow flies, approximated by road distance) is z which can be broken down into a distance *shipper-terminal* (y) and a long-haul (x),

where $z \leq y + x$. With [Equation (1)] $r_A\{x\}$ can be rewritten as $C * C_T\{x_A\}$, where x_A is the long-haul distance Railroad A uses as basis for the long-haul rate. The shipper perceives no difference between alternatives A and C if the total costs he will incur are equal:

$$C * C_T * x_A + C_T * y_A = C * C_T * x_C + C_T * y_C \quad (a)$$

$$\Leftrightarrow C_T * (C * x_A + y_A) = C_T * (C * x_C + y_C) \quad (b)$$

where C_T is a rate equal to average total cost set under perfect competition (remember: It was assumed that the short-haul carrier is perfectly competitive in its primary market and that contestability means perfect economical substitutability of the modes, which means that the conditions of the short-haul carrier's market [perfect competition] become the conditions of the common market). C is set by external conditions that govern the rate differential of two modes $\delta r_{HL} = (r_H - r_L)$ of the two modes [Equation (1)]. According to [Equation (b)], in the perfect contestable case that combination of segments of haul [(i) Railroad A + short haul y_A , or (ii) Railroad C + short haul y_C , or (iii) the entire haul (z) by truck] with the shortest total length is the most favorable one, which is truck. The less contestable the market is, the more favorable that combination that has the largest portion of the total haul hauled by the long-haul mode (rail) becomes (i.e., the lower

$$\Delta r_{AC} = r_A - r_C = C_T\{y_C\} - C_T\{y_A\}. \quad (2)$$

That is, in determining the terms at which intermodal service is available to shippers, the location of transshipment facilities is extremely important because the terms of intermodal service heavily depend on the distances between the customer and the transshipment facilities. As the distance increases, the transit time and hence the cost of intermodal service increases because more high-cost carrier service is taken up, which increases the rates competing long-haul providers may charge without losing business.

Generally, the findings suggest that the concept of perfect contestability does not hold in a local multi-mode transportation market. In terms of [Equation (1)], perfect contestability among modes means equal rates per unit of production. Equal rates generally imply equal costs, which in the case of rail and truck is most unlikely to be correct. From that point, there can never be any perfect contestability among railroad and truck. The ratio *cost covering rail rate*

rates the railroad could theoretically charge. However, if there is a gap between the rate a railroad could theoretically charge and the second lowest bid, the railroad may fill that gap through excess profit. This finding is immediately comprehensible and is consistent with the finding from the non-contestable edge. The finding also is consistent with [Equation (1)] if [Equation (1)] is approached mathematically: Perfect contestability among modes means nothing but physically equal costs per unit of production, which can, with respect to rail and truck, never be the case. From that point, there can never be perfect contestability among rail and truck. Moreover, at least in a local

per ton-mile over cost covering truck rate per ton-mile, in conjunction with differences in the distance shipper-terminal, has an impact on rail rates, but unless this ratio is equal to one, which is not realistic, railroads do have a cost advantage over trucks allowing for excess profits.

4. Particular Markets

a. Intermodal Container Transportation between the Ohio River Region and the North Atlantic Coast Region

In section B.2. of this chapter, intermodal container transportation between the Ohio River region and the North Atlantic Coast region was identified to be most likely to be contestable. In intermodal container transportation, the high-cost carrier service can be provided either by the same ownership entity that provides the long haul or by an independent firm. The first case constitutes a natural monopoly (see section A.1. of this chapter) which is, compared to the second alternative, less likely to be contestable. If independent firms provide the short-haul, there is a potential for vigorous competition among high-cost carriers for the haul over the distance shipper-transshipment facility. In section B.3. of this chapter the foundations for contestability at the level of the shipper were developed. For a transportation market to be perfectly contestable, the rate

setting, a railroad has always an advantage compared to trucking firms (see findings from

differentials of railroad service and trucking service at the originating market and at the destination markets have to be equal to zero, which is quite unlikely to be the case in reality. Consequently, the market at issue is not perfectly contestable.

On the other hand, in both the Ohio River region and in the North Atlantic Coast region there are numerous independent trucking firms providing potential competitive transportation services between hub facilities and customers. Thus, it is likely that there is a competitive finite trucking rate r_H that leads to a contestability degree greater than 0 and a monopoly degree of $M = (1-C)$ less than 1. Thus, the intermodal container transportation market between the Ohio River region and the North Atlantic Coast region shows some contestable characteristics but is not perfectly contestable. The bottom line of this market structure is that railroads do have a positive advantage, trucking firms do have an advantage equal to zero, and shippers have a negative advantage. The availability of trucking service, which is competitive in its primary market and which is a physical substitute for railroad service, constitutes an upper boundary of the railroad's advantage and a lower boundary on the shipper's disadvantage.

b. Transportation of Grain out of North Dakota

Table X on page 123 shows that transportation of grain out of North Dakota has been identified to be the least potentially contestable market in the U.S. There has been evidence that railroad pricing in this market is monopolistic.²⁴²

North Dakota represents a classic captive market. First, North Dakota is served by only two railroads, Burlington Northern and the Soo Line. Second, the degree of intermodal competition is limited. Due to the great distances to major markets of consumption, processing, and export, such as the Pacific Northwest, the East Coast, and the Gulf, trucking is not an economically feasible mode in transporting grain out of North Dakota. North Dakota's nearest barge loading facility for grain is Minneapolis/St. Paul in Minnesota, over 200 miles from the nearest North Dakota city and operational only two-thirds of the year. Hence, barge competition is virtually nonexistent. Third, the primary products produced in North Dakota are relatively unique to the region so rail rates are not constrained much by competition with product substitutes from different regions moving at competitive rates.

²⁴² See Koo, 1993. Includes further references. See also Schmitz, 1995.

Between 1984 and 1989, over 73 percent of the grain shipments from North Dakota moved by rail.²⁴³ In 1996, the rate for a grain car trip from Bismarck, North Dakota to Minneapolis (400 miles) was \$2,300. The rate for a grain car trip from Minneapolis to Chicago (also 400 miles), however, was \$1,000. The only difference between these routes is that the route from Bismarck to Minneapolis is a monopoly route while the route from Minneapolis to Chicago is not.²⁴⁴ This gives clear evidence that railroads take advantage of market power if there is an opportunity to do so.

Railroads defended themselves on charges of abuse by noting that the number of complaints against rail rates has been decreasing over the years. In the early 1990s, fewer than ten complaints and protests per year were filed with the ICC compared with nearly 300 per year before 1980.²⁴⁵ A reason for this decline might be that the ICC has been increasing fees for filing rate complaints. In 1995, the cost of challenging a single rate under current ICC standards for "market dominance" and "rate reasonableness" was about \$250,000 - \$500,000, a prohibitive cost for a small country elevator.²⁴⁶ In 1996, the Surface

²⁴³ Koo, 1993.

²⁴⁴ Congressional Press Releases, 1997.

²⁴⁵ U.S. Department of Commerce, 1994.

²⁴⁶ Kocemba, 1995.

Transportation Board proposed to increase the fees for filing rate complaints by 23,000 percent, from \$1,000 up to \$233,000.²⁴⁷

c. Transportation of Coal - "Bottlenecks"

Transportation of solid bulk material out of the region West of the Missouri River has been identified to be the second least potentially contestable market in the U.S. (Table X on page 123). Presently, railroads are accused of abusing market power in the coal business. A "bottleneck case" is constituted if two or more railroads serve the origin point of coal but only one railroad serves the destination (usually an electric utility plant). Generally, the competing railroads are asking the Surface Transportation Board to require the "bottleneck carrier" to offer only a local service, short-haul rate from the closest interchange point to the final destination which would enable them to compete on the long-haul and interchange cars at the interchange point. Utilities also attempt to challenge the reasonableness of the rate over the bottleneck part. In the most recent "bottleneck case" which involved Union Pacific, Conrail, the STB ruled against the utility, deciding that both the law and precedent made it clear that a shipper cannot insist that a "bottleneck railroad" provides only a short-haul service under

²⁴⁷ Schulz, 04/15/96.

a local rate that could be separately challenged if the carrier also provides origin-to-destination service by itself or in conjunction with another railroad.²⁴⁸

C. Is Open-Access a Working Alternative?

Due to cases of abuse of market power on the part of railroads, injured parties - mostly farmers, mining firms, and public utilities - have been rising claims for greater government participation in the railroad industry.²⁴⁹ In particular, proponents of re-regulation promote requiring railroads to open their track to competitors for some form of access fee proportional to use. More radical minded proponents of re-regulation even suggest government ownership of track or ownership of the track by a person prohibited from acting as a carrier.

The argument is that open-access would break up monopoly routes since any railroad would have access to any track. In a structural sense, open-access means transition from a monopoly to a more competitive stage by stimulating entry. Competition among railroads would decrease the probability of earning a rent. It also would at least reduce prevalent rate discrimination against product and geographic markets (see section B.4. of this chapter on page 132) and

²⁴⁸ Welty, 1997.

²⁴⁹ Edwards, 10/13/96, and Burke, 09/23/96.

hence eliminate some major opportunities for cross-subsidizing. In the past, competition among railroads lead to destructive competition.²⁵⁰ The ultimate cause of destructive competition are high fixed costs of infrastructure (which are also sunk costs) that need to be allocated among output. Under open-access regulation which would leave ownership of track with the railroads, railroads would recover at least a share of fixed costs via access fees. Further, since each railroad were likely to take up some track of other railroads for which fees had to be paid, these (former fixed costs) were then changed into variable cost. Thus open-access, even with ownership of track left with the railroads, would reallocate fixed costs as variable costs and hence would take away the base of destructive competition. Government ownership of track would *fully* reallocate fixed costs of infrastructure as variable costs as long as fees payable were tight to actual demands. In effect, government ownership of railroad infrastructure would move the railroad industry closer to conditions under which the trucking industry is operating. The trucking industry does not own road infrastructure, however, it finances the major share (but less than its engineering share) of the interstate highway system via taxes.²⁵¹

Opposition to open-access comes from the railroads. Railroads claim open-access would discourage investment in new equipment and facilities and

²⁵⁰ See Footnote 21 on page 20.

that it would hurt customer service in the long run.²⁵² Admittedly, the prospect of exclusive usage of investments and of a future monopoly rent may be a stronger incentive for investing in assets than the prospect of earning a normal profit. Moreover, commonly used infrastructure may be an incentive to shirk which would lead to deterioration. It can also be argued that only a “rent” may provide funds for future investments. On the other hand, the prospect of being a monopolist may even not require any improvements at all because shippers will have no choice anyway. This argument for open-access is quite credible when contemplating the different market segments of railroads and trucking services by ranking them by their degree of competition: The North Dakota grain transportation market would be located on the monopolistic edge, followed by transportation of coal and so on. The most competitive edge would be the truck-load (TL) trucking market, followed by the less-than-truck-load (LTL) trucking service and then followed by intermodal service involving railroads. The observation is that the more competitive the market is, the better is the customer service perceived by shippers.²⁵³ Therefore, open-access is most likely to improve railroad service rather than to harm service. The argument that open-access will not work technically has been disproved by the fact that Amtrak has been operating for more than 25 years almost exclusively under trackage rights agreements.

²⁵¹ United States General Accounting Office (GAO), 1993, p. 12.

In sum, open-access appears to be a working alternative to improve railroad service through enlivening intramodal competition without bearing the drawbacks formerly experienced in connection with railroad competition. However, since there are basically only five competing firms in the industry, the industry will remain an oligopoly which facilitates collusion and cartelization. That is, although open-access would formally establish competition, railroads could tacitly enter into mutual agreements not to serve certain markets so that each railroad would remain a monopolist in a particular market. A similar development has occurred in the deregulated airline industry where each major carrier dominates several different hub airports.²⁵⁴

²⁵² Edwards, 10/13/96, and Burke, 09/23/96.

²⁵³ See Kocemba, 1995 and United States General Accounting Office (GAO), 1993.

²⁵⁴ Blechschmidt, 1996, p. 50.

CHAPTER VI.

CONCLUSIONS

Deregulation has achieved its primary goal. The financial condition of railroads has bettered remarkably. Railroads were able to increase their rate of return to levels that had never been reached since the late 1920s.²⁵⁵ Increases in profitability have been accompanied by dramatic increases in productivity.

In addition, firm concentration of Class I railroads has reached dimensions far beyond anti-competitive levels. Only five major railroads remain in the U.S. All major railroads have acquired different modes of transportation and have entered the emerging market for intermodal transportation. Taking the characteristics of natural monopolies into account, the trend towards intramodal and *intermodal* concentration is consistent with monopoly price discrimination tactics. However, concentration was assumed to not be harmful to competition because of the presence of intermodal competition (contestability).

The findings of this study suggest that in general deregulation of railroads on the basis of contestable markets is not justified. By definition, the

(intramodal) railroad transportation market can never be contestable as long as railroads own infrastructure because infrastructure constitutes major sunk costs. Sunk costs are not allowed in a contestable market.²⁵⁶ Open-access to trackage would eliminate sunk costs, the main barrier to entry. The intramodal railroad market would be contestable if all significant barriers to entry were abolished and if market entry would occur upon any one firm earning an excess profit. However, even if all barriers to entry were abolished, entry at the local level, where competition actually occurs, would not happen. Thus, railroad profitability and extensive entry are mutually exclusive.²⁵⁷ With respect to the entire market, railroads have an incentive to intentionally refrain from entry into particular markets in order to mutually maintain profits. Thus, entry is unlikely to occur even in the absence of barriers to entry.²⁵⁸ Cases of exertion of monopoly power in the markets for transportation of grain and coal provide evidence that the intramodal railroad transportation market is monopolistic if unregulated.

In intermodal transportation the degree of contestability depends on whether or not railroads own other modes of transportation. If railroads own other modes of transportation, the entire chain of intermodal transportation is a

²⁵⁵ Previous years have not been taken into account because of differences in accounting methods.

²⁵⁶ See The Contestable Market Theory on page 22.

²⁵⁷ See The Local Market on page 125.

natural monopoly which is not contestable. If railroads do not own other modes of transportation, then the intermodal transportation market **only** can be considered to be contestable to the extent to which railroad service is technically and economically substitutable **and** to the extent suitable substitutes are available. It has been shown that railroad service is never fully economically substitutable by other modes. Therefore, intermodal transportation never can be fully contestable. To conclude, there is no railroad market segment that is truly contestable and the predictions of the contestable market theory do not hold in practice respectively.

In addition to the railroad industry's recent deregulation, the airline industry also has been deregulated recently. In 1978, it was argued the airline industry would be highly contestable after deregulation. In 1996, Blechschmidt found that the airline industry did **not** exhibit the characteristics of a contestable market after deregulation. Particularly, there are distinct barriers to entry erected by incumbents at hub cities that bar entry into the industry and preserve local monopolies.²⁵⁹

²⁵⁸ It can be distinguished between entry by existing railroads and entry by new railroads. Entry by existing railroads is easier than entry by new railroads. Thus, no entry by existing railroads means no entry by new railroads.

²⁵⁹ Blechschmidt, 1996, p. 73.

The political settings of the 1970s and 1980s give a credible explanation why the contestable market theory does not hold in practice.²⁶⁰ When the Bell System came under antitrust challenge in 1974, AT&T employed economists, who later became known as the Baumol group, at least partly to formulate ideas to resist the antitrust suit and later to resist entry into its markets. The contestability idea has been taken up by other witnesses representing dominant firms other than AT&T. Thus the purpose of the contestable market theory was to provide an argument in favor of dominant firms rather than to explain real market structures.

If the present merger policy is not changed, then concentration in the railroad industry will continue, and the United States will be left with only one or two major railroads in the near future. Those railroads will be operating at large scale (both in intra- and intermodal transportation) and hence at low average total cost, which is a potential benefit for the society. On the other hand, since then all competition will have been taken away, those railroads will have the ability to fully exploit their monopoly power. Given the non-contestability of the railroad monopoly as well as past experience, the latter is likely to happen. Thus, only a political shift towards more rigid merger guidelines can protect society from being at the mercy of the railroads.

²⁶⁰ Shepherd, 1995.

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